

EXHIBIT J



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Chen

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(45) **Date of Patent:** ***May 26, 2020**

(54) **APP BASED FREE SETTING METHOD FOR SETTING OPERATING PARAMETER OF SECURITY LIGHT**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

33/0818; H05B 33/0824; H05B 33/0827; H05B 33/0854; H05B 33/0863; H05B 33/0872; H05B 37/0227; H05B 37/0272; H05B 37/0281; F04D 25/06; F04D 25/088; F04D 25/004; F04D 25/005; F04D 25/325; F21V 33/0096; G06F 3/04847; G06F 3/04883; G06F 3/04886; G08B 15/00;

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(22) Filed: **Oct. 29, 2018**

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(63) Continuation of application No. 15/255,493, filed on Sep. 2, 2016, now Pat. No. 10,154,564, which is a (Continued)

(51) **Int. Cl.**
H05B 37/02 (2006.01)
H05B 33/08 (2020.01)

(Continued)

(52) **U.S. Cl.**
CPC **H05B 47/11** (2020.01); **F04D 25/06** (2013.01); **F04D 25/088** (2013.01); **F04D 27/004** (2013.01); **F04D 29/005** (2013.01); **F04D 29/325** (2013.01); **F21V 33/0096** (2013.01); **G06F 3/04847** (2013.01); (Continued)

(58) **Field of Classification Search**
CPC H05B 37/0218; H05B 33/0815; H05B

Primary Examiner — Brandon S Cole

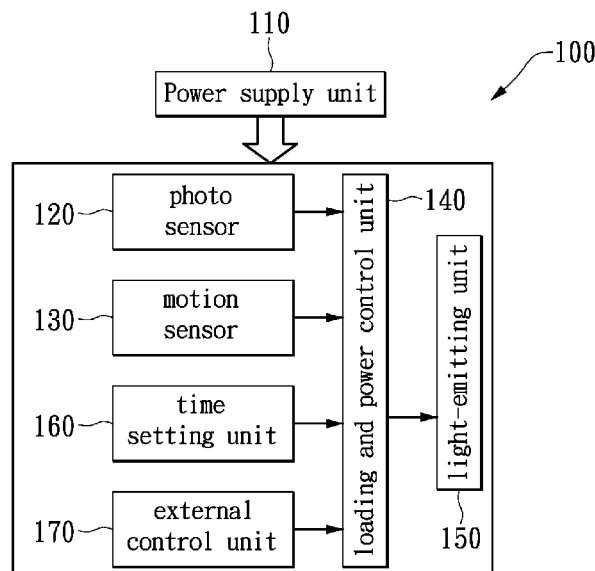
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(57)

ABSTRACT

An on line free setting method for setting an operating parameter of a lighting device is disclosed. The method involves using a user interface APP comprising at least one free setting algorithm preloaded in a mobile device to transform a user's setting decision into an operating variable of an operating parameter of the lighting device, wherein the user interface APP is operable on a touch screen panel of the mobile device; wherein the free setting algorithm is a capacity scale simulation process implemented by operating a visual configuration of a free setting operator interacting with a capacity scale simulator and an indicator of the capacity operating rate to facilitate making the user's setting decision, wherein the operating parameter is used for controlling various functional performances of the lighting device including light intensity, light color temperature, delay time and detection sensitivity.

60 Claims, 19 Drawing Sheets



US 10,667,367 B2

Page 2

Related U.S. Application Data

continuation-in-part of application No. 15/072,602, filed on Mar. 17, 2016, now Pat. No. 9,560,719, which is a continuation of application No. 14/487,334, filed on Sep. 16, 2014, now Pat. No. 9,326,362, which is a continuation-in-part of application No. 13/222,090, filed on Aug. 31, 2011, now Pat. No. 8,866,392.

(51) **Int. Cl.**

H05B 37/00 (2006.01)
G06F 7/06 (2006.01)
G09G 5/00 (2006.01)
G06F 17/00 (2019.01)
H05B 47/11 (2020.01)
F21V 33/00 (2006.01)
G06F 3/0488 (2013.01)
G06F 3/0484 (2013.01)
F04D 25/08 (2006.01)
F04D 25/06 (2006.01)
F04D 27/00 (2006.01)
F04D 29/00 (2006.01)
F04D 29/32 (2006.01)
G08B 15/00 (2006.01)
H05B 45/10 (2020.01)
H05B 45/20 (2020.01)
H05B 45/37 (2020.01)
H05B 45/44 (2020.01)
H05B 45/46 (2020.01)
H05B 47/16 (2020.01)
H05B 47/19 (2020.01)
H05B 47/105 (2020.01)
G08B 13/189 (2006.01)
F21Y 115/10 (2016.01)

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(58) **Field of Classification Search**

CPC ... **G08B 13/189**; **F21Y 2115/10**; **Y02B 20/42**; **Y02B 20/44**; **Y02B 20/46**
 USPC **315/290–311**
 See application file for complete search history.

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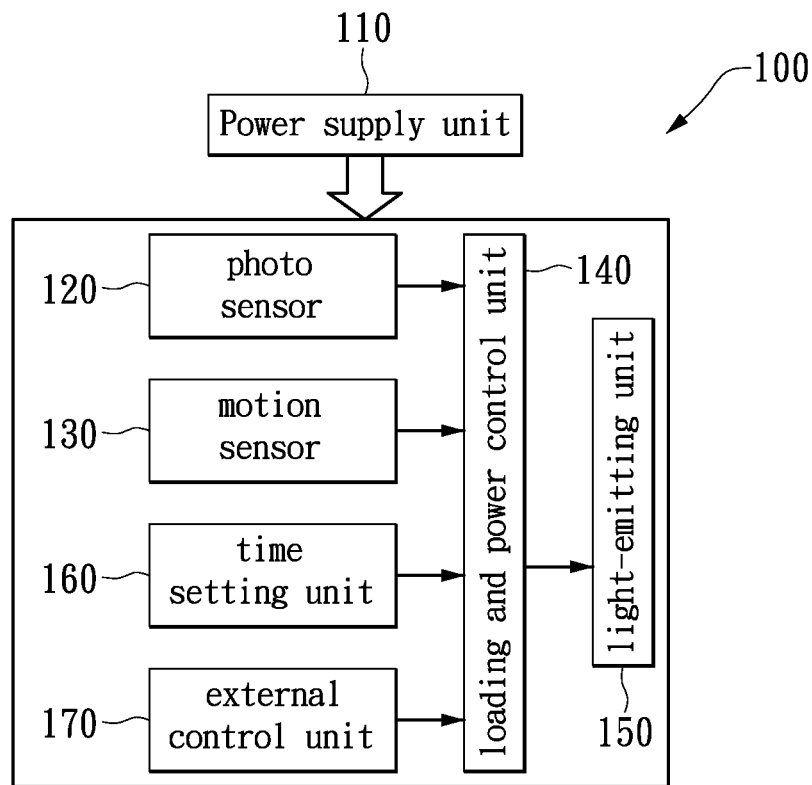


FIG. 1

U.S. Patent

May 26, 2020

Sheet 2 of 19

US 10,667,367 B2

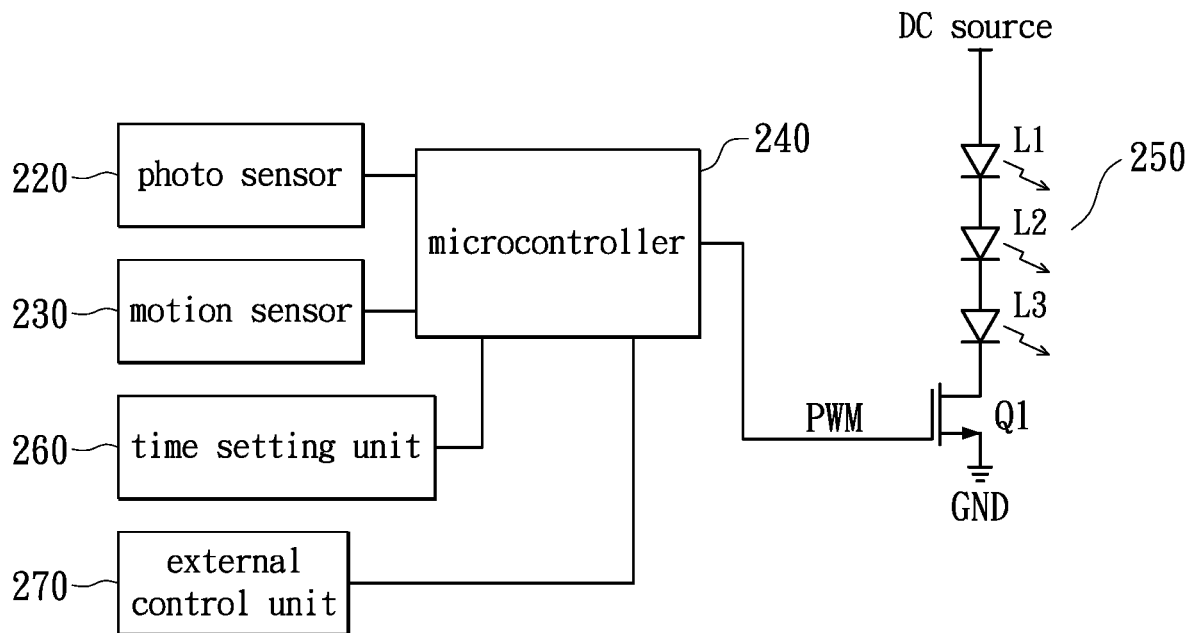


FIG. 2A

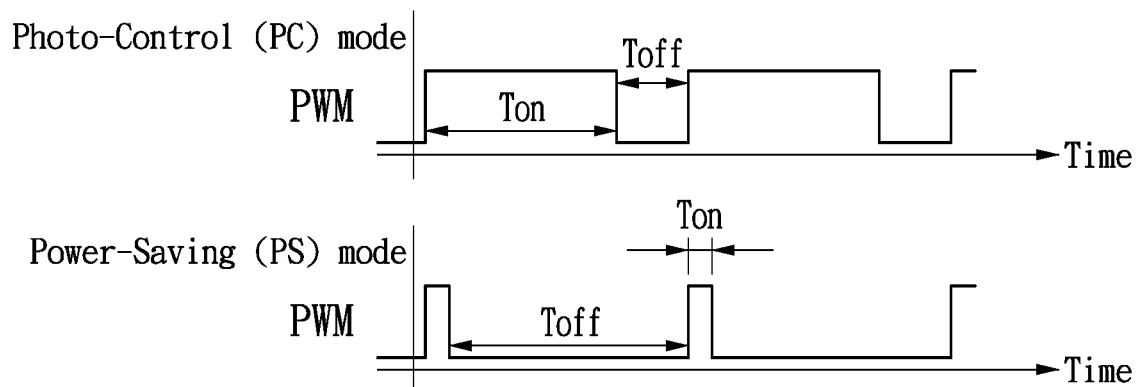


FIG. 2B

U.S. Patent

May 26, 2020

Sheet 3 of 19

US 10,667,367 B2

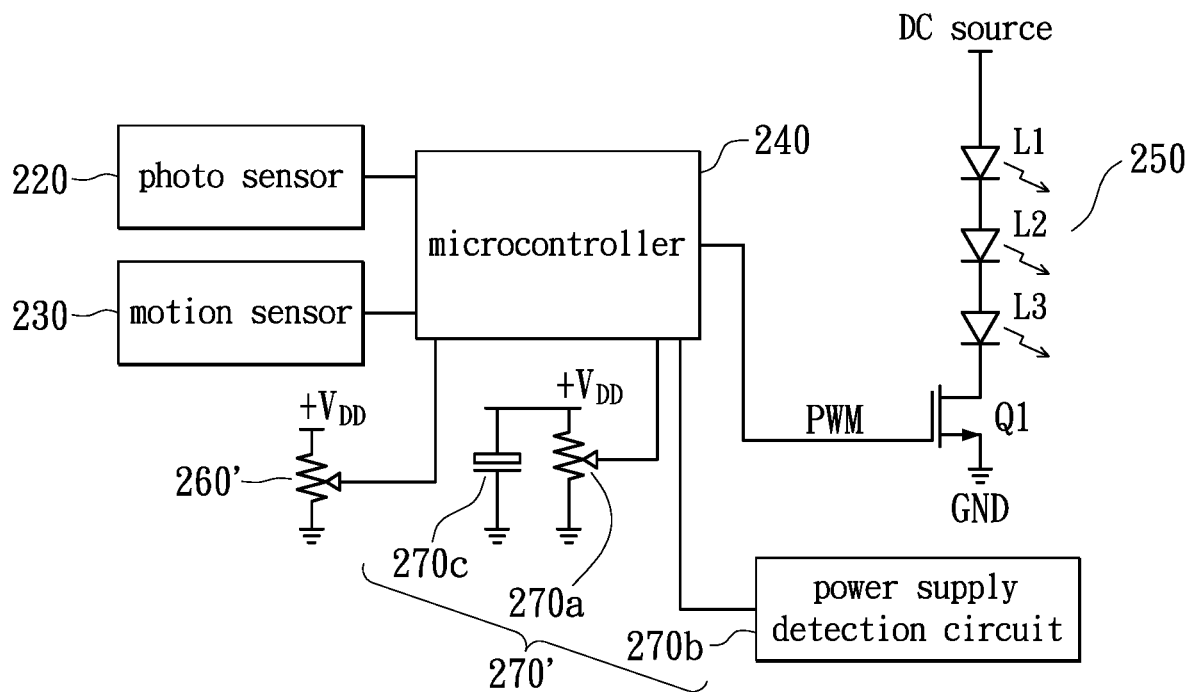


FIG. 2C

U.S. Patent

May 26, 2020

Sheet 4 of 19

US 10,667,367 B2

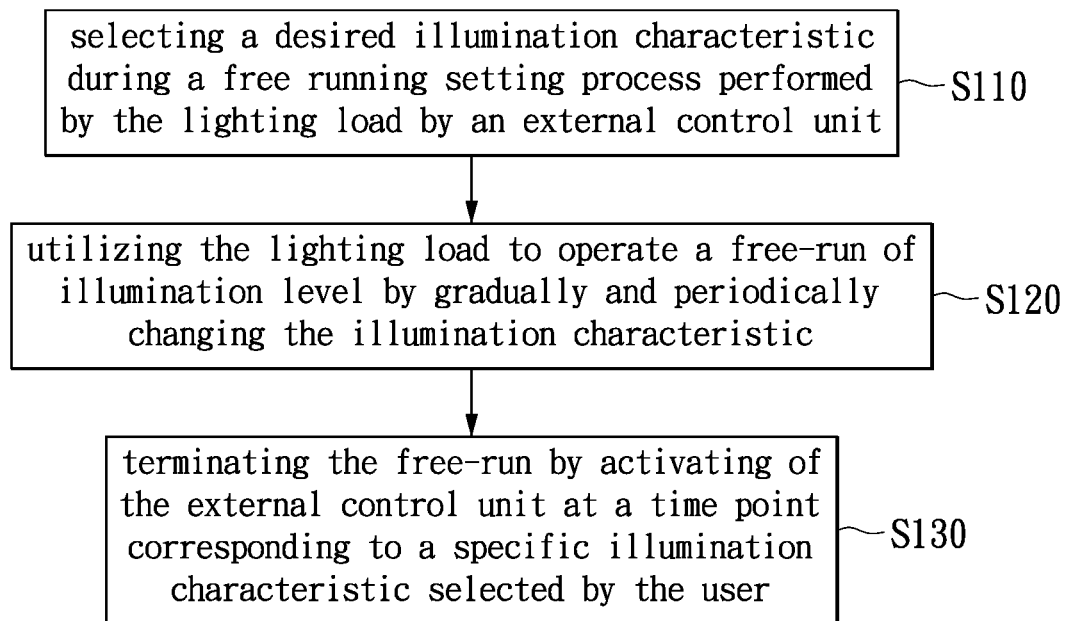
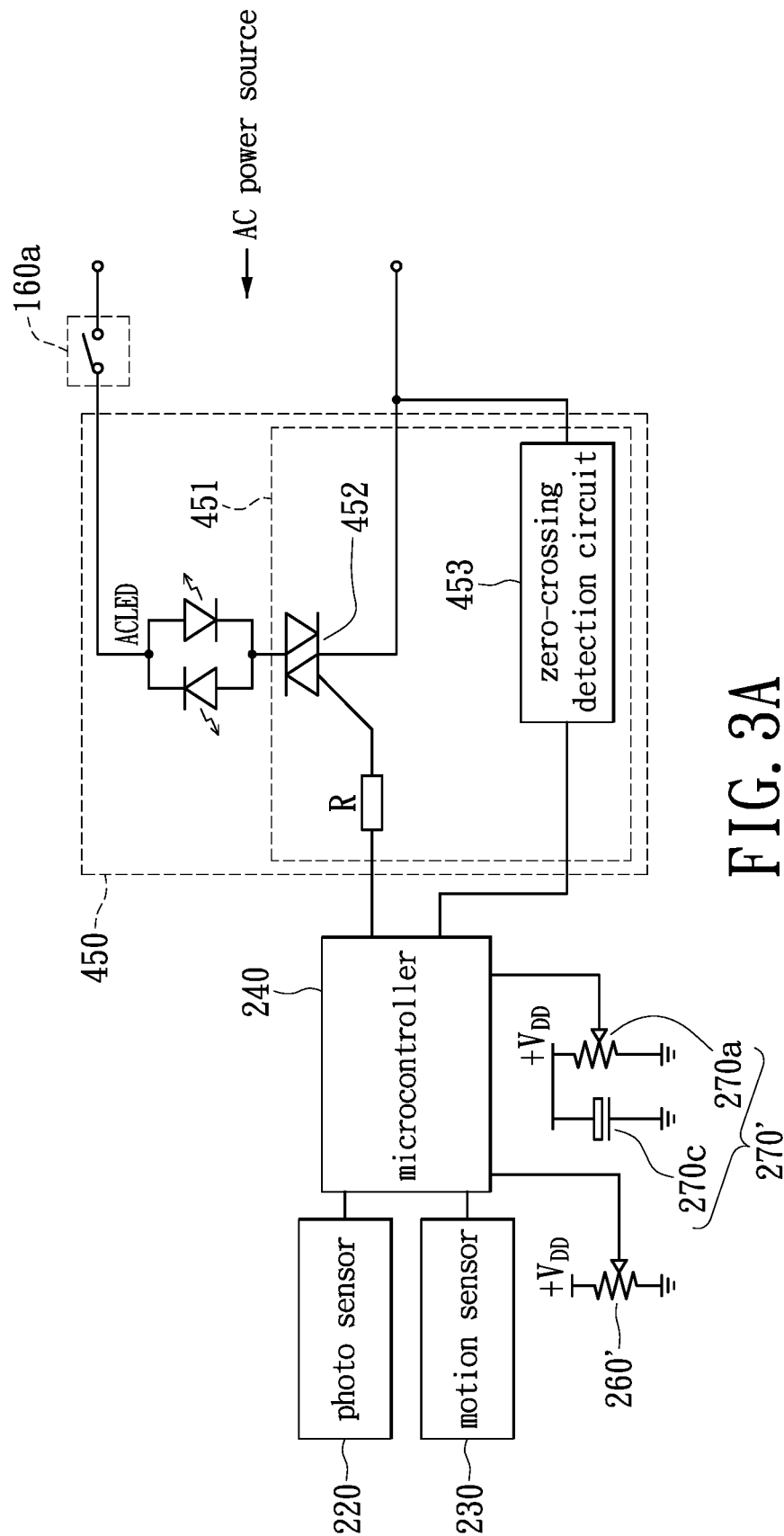


FIG. 2D



U.S. Patent

May 26, 2020

Sheet 6 of 19

US 10,667,367 B2

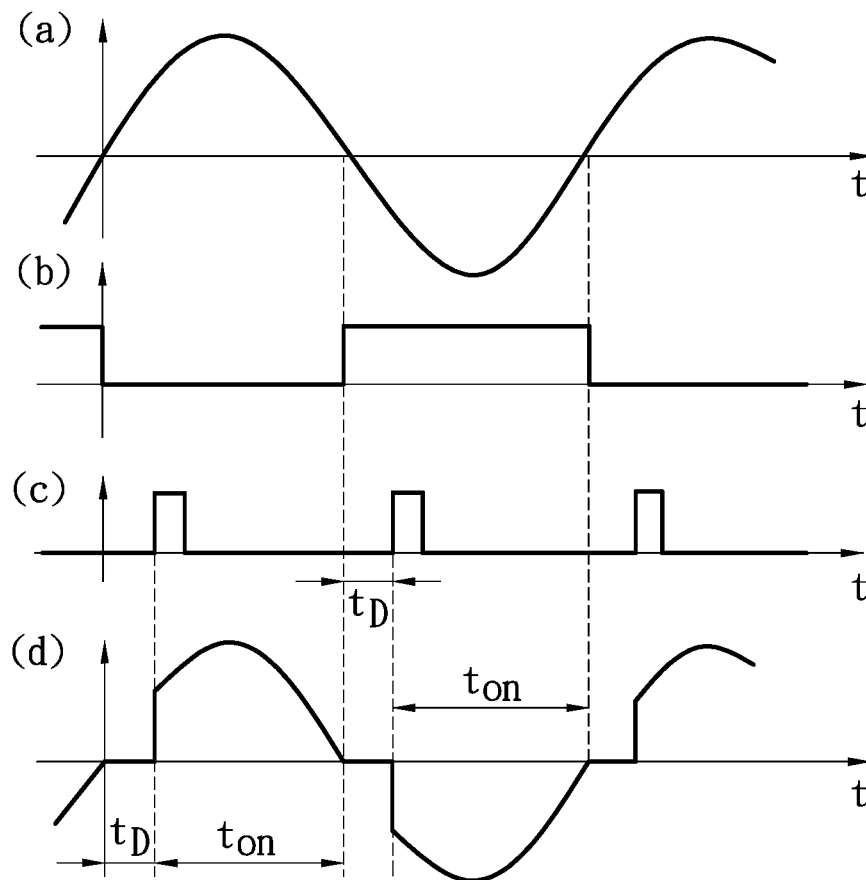


FIG. 3B

U.S. Patent

May 26, 2020

Sheet 7 of 19

US 10,667,367 B2

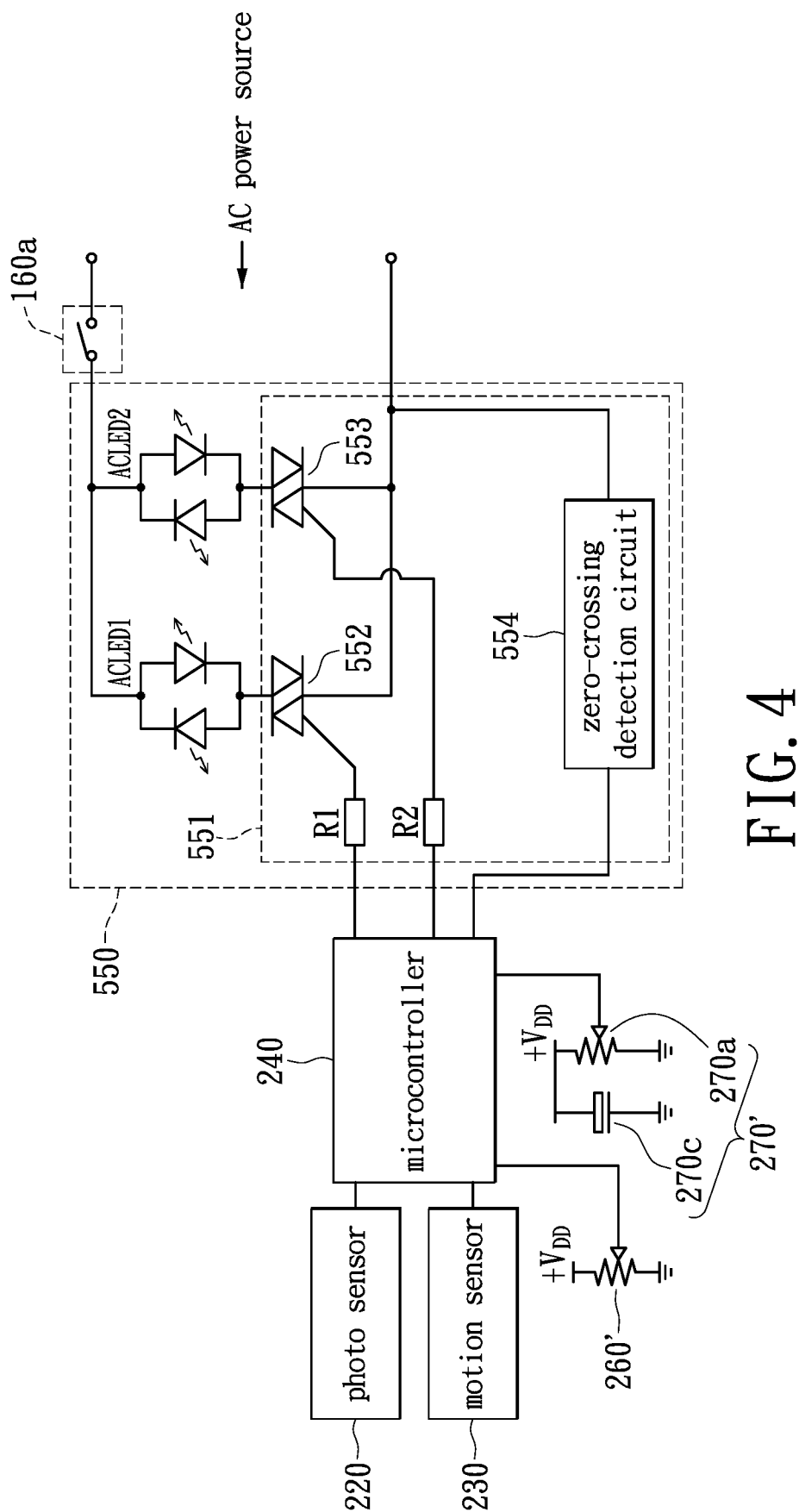


FIG. 4

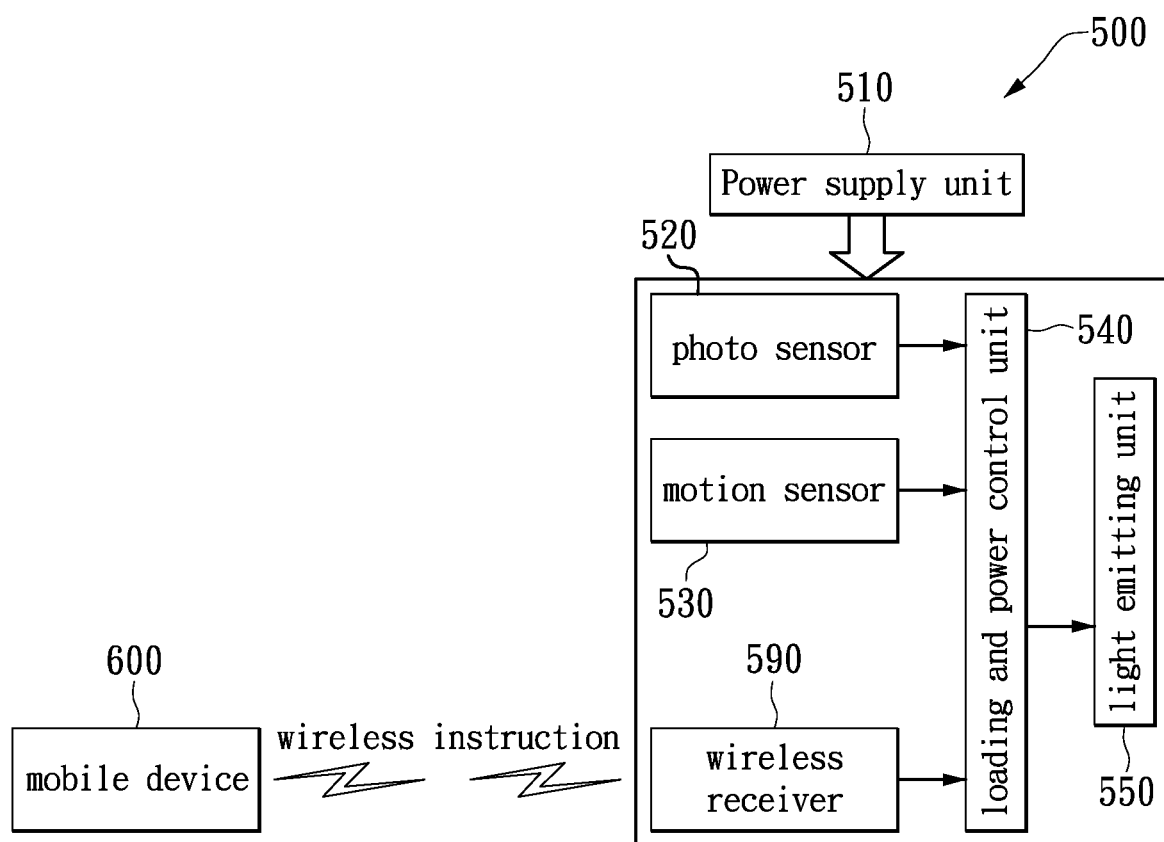


FIG. 5

U.S. Patent

May 26, 2020

Sheet 9 of 19

US 10,667,367 B2

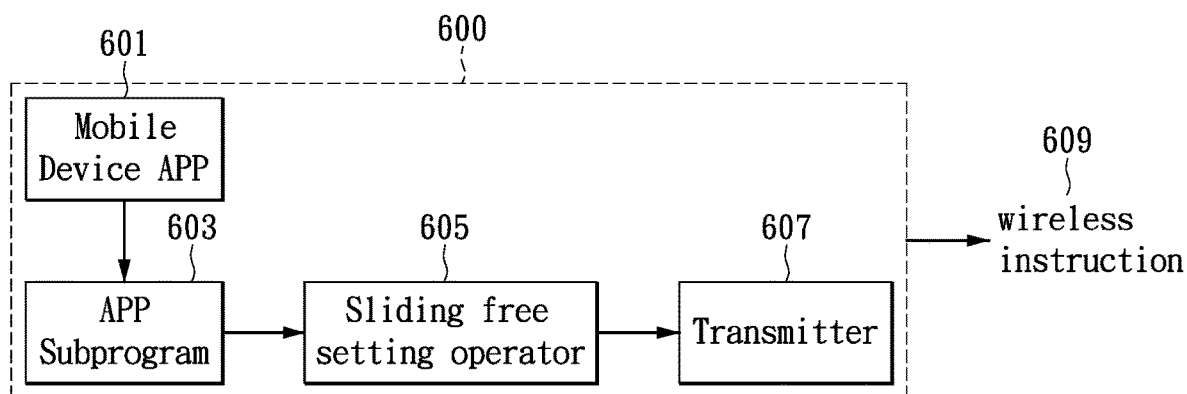


FIG. 6A

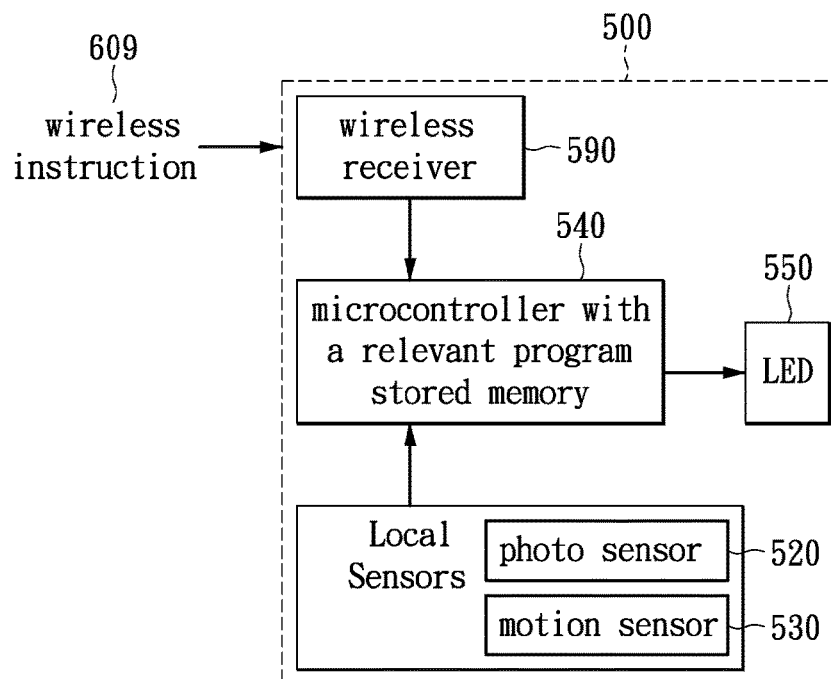


FIG. 6B

U.S. Patent

May 26, 2020

Sheet 10 of 19

US 10,667,367 B2

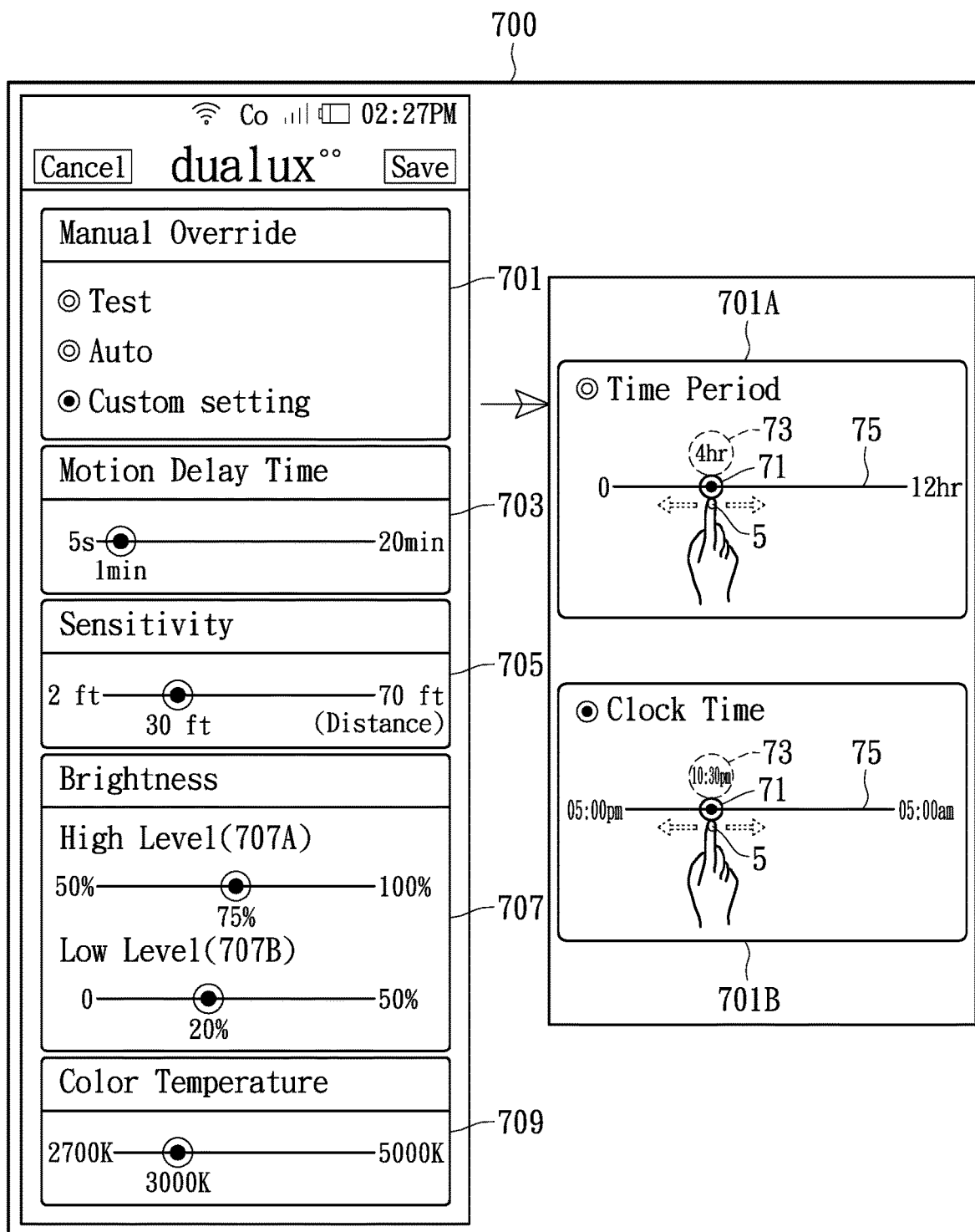


FIG. 7

U.S. Patent

May 26, 2020

Sheet 11 of 19

US 10,667,367 B2

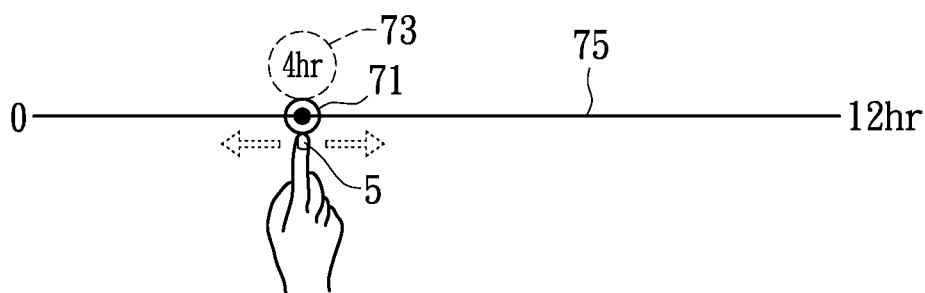


FIG. 7A

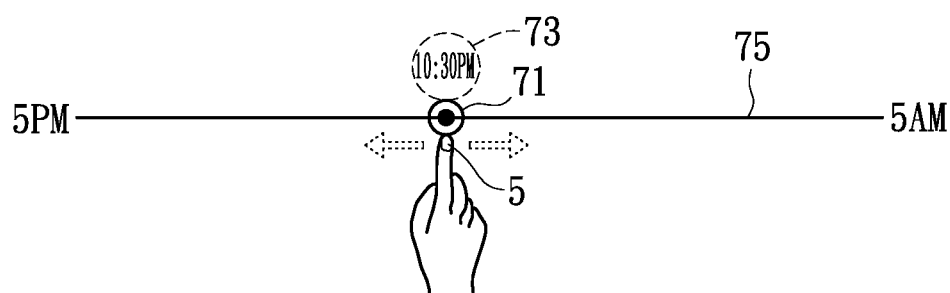


FIG. 7B



FIG. 7C

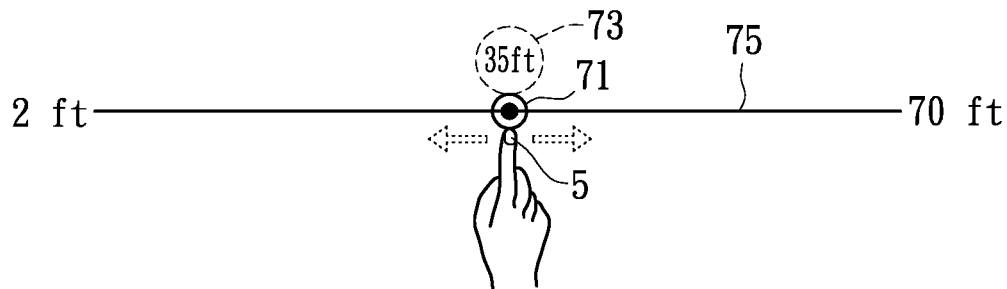


FIG. 7D

U.S. Patent

May 26, 2020

Sheet 12 of 19

US 10,667,367 B2

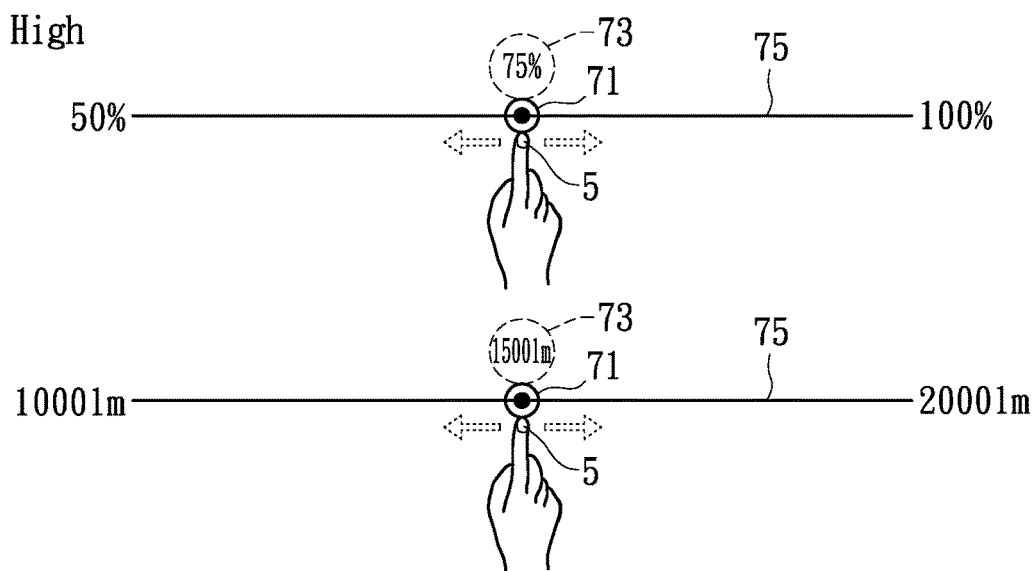


FIG. 7E

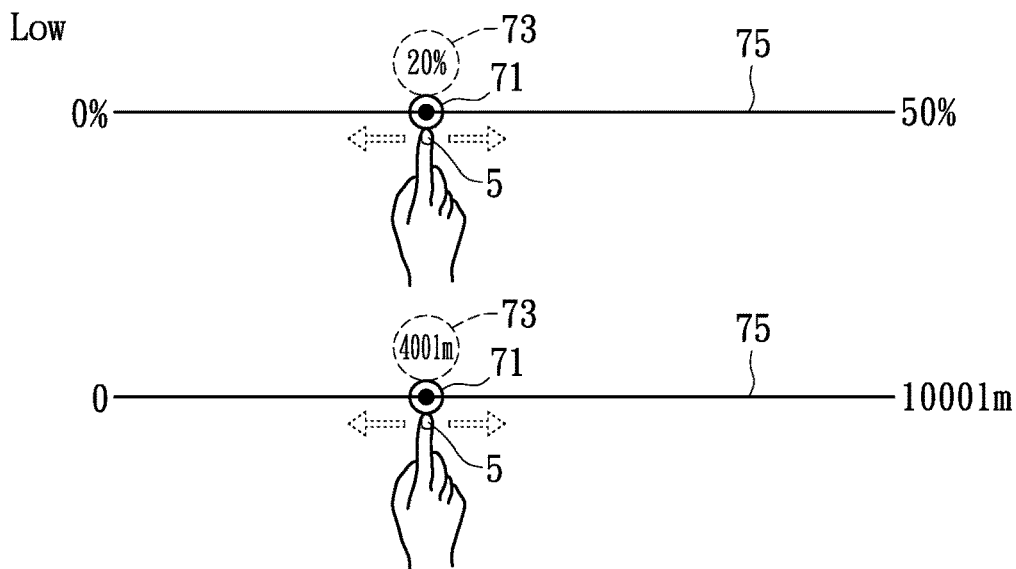


FIG. 7F

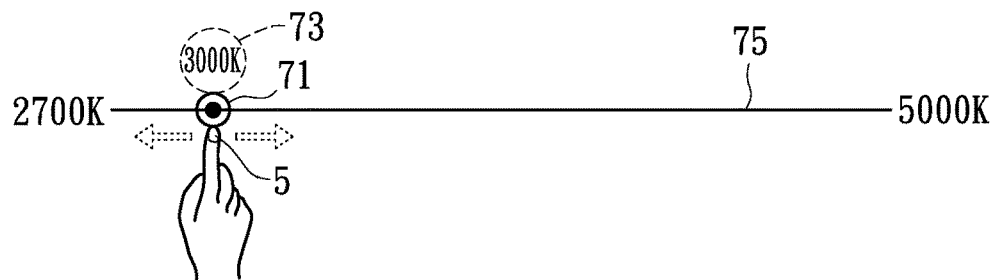


FIG. 7G

U.S. Patent

May 26, 2020

Sheet 13 of 19

US 10,667,367 B2

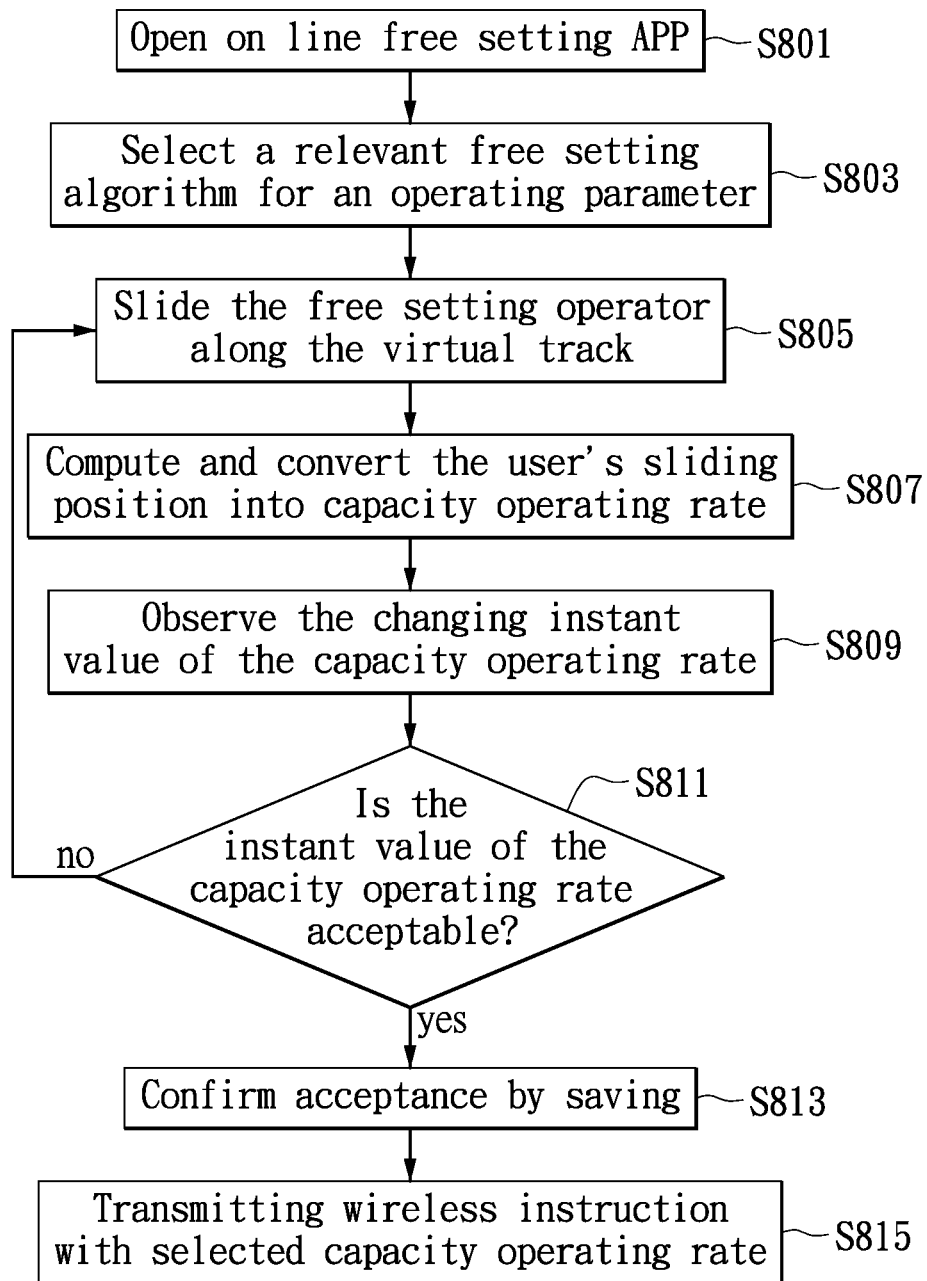


FIG. 8A

U.S. Patent

May 26, 2020

Sheet 14 of 19

US 10,667,367 B2

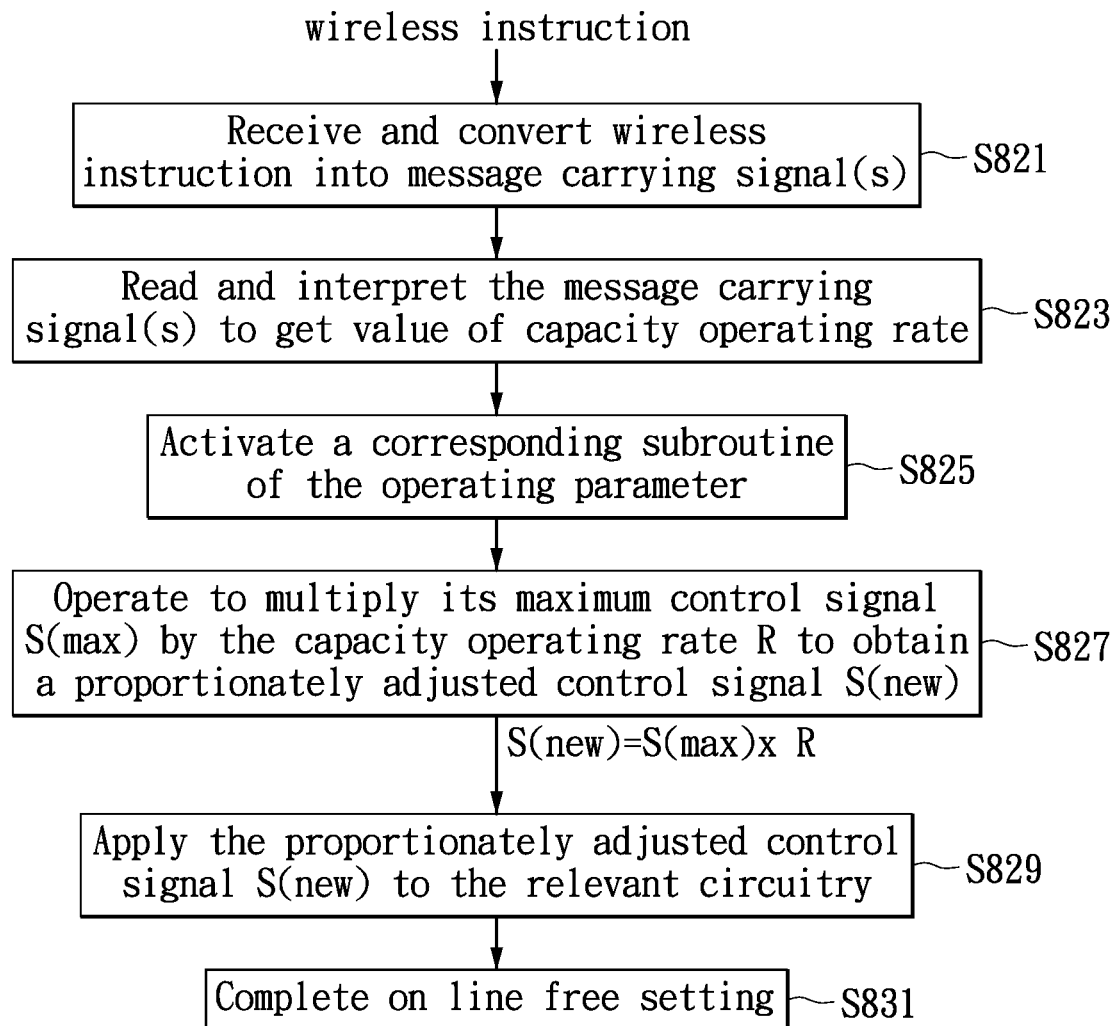


FIG. 8B

U.S. Patent

May 26, 2020

Sheet 15 of 19

US 10,667,367 B2

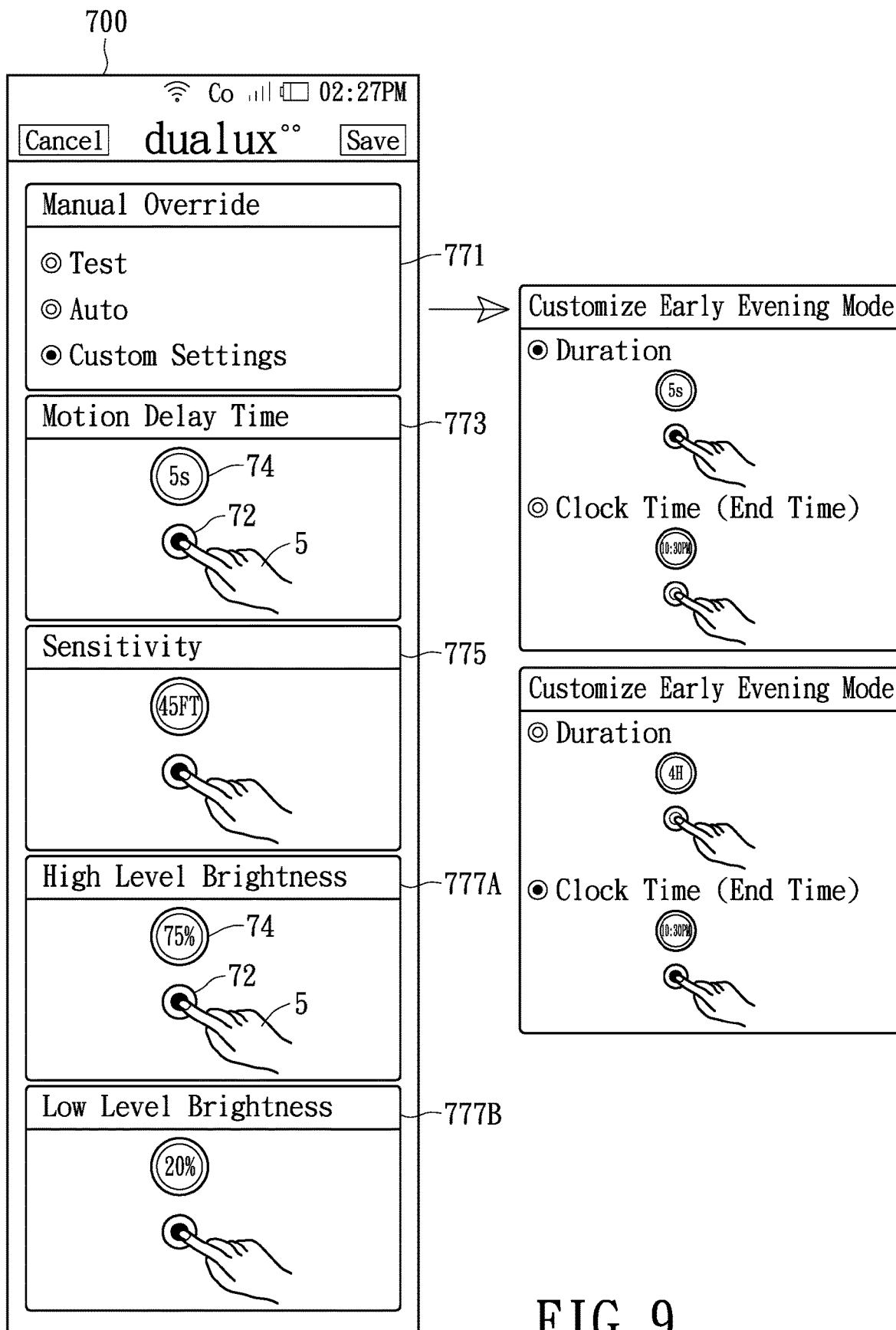


FIG. 9

U.S. Patent

May 26, 2020

Sheet 16 of 19

US 10,667,367 B2

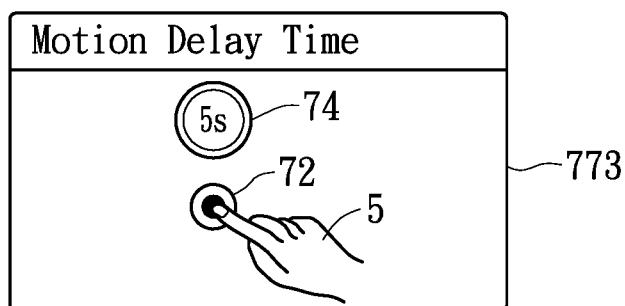


FIG. 9A

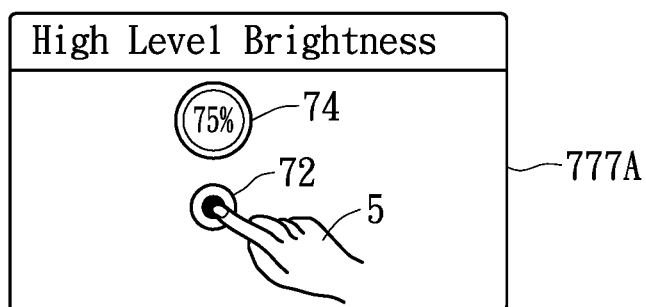


FIG. 9B

U.S. Patent

May 26, 2020

Sheet 17 of 19

US 10,667,367 B2

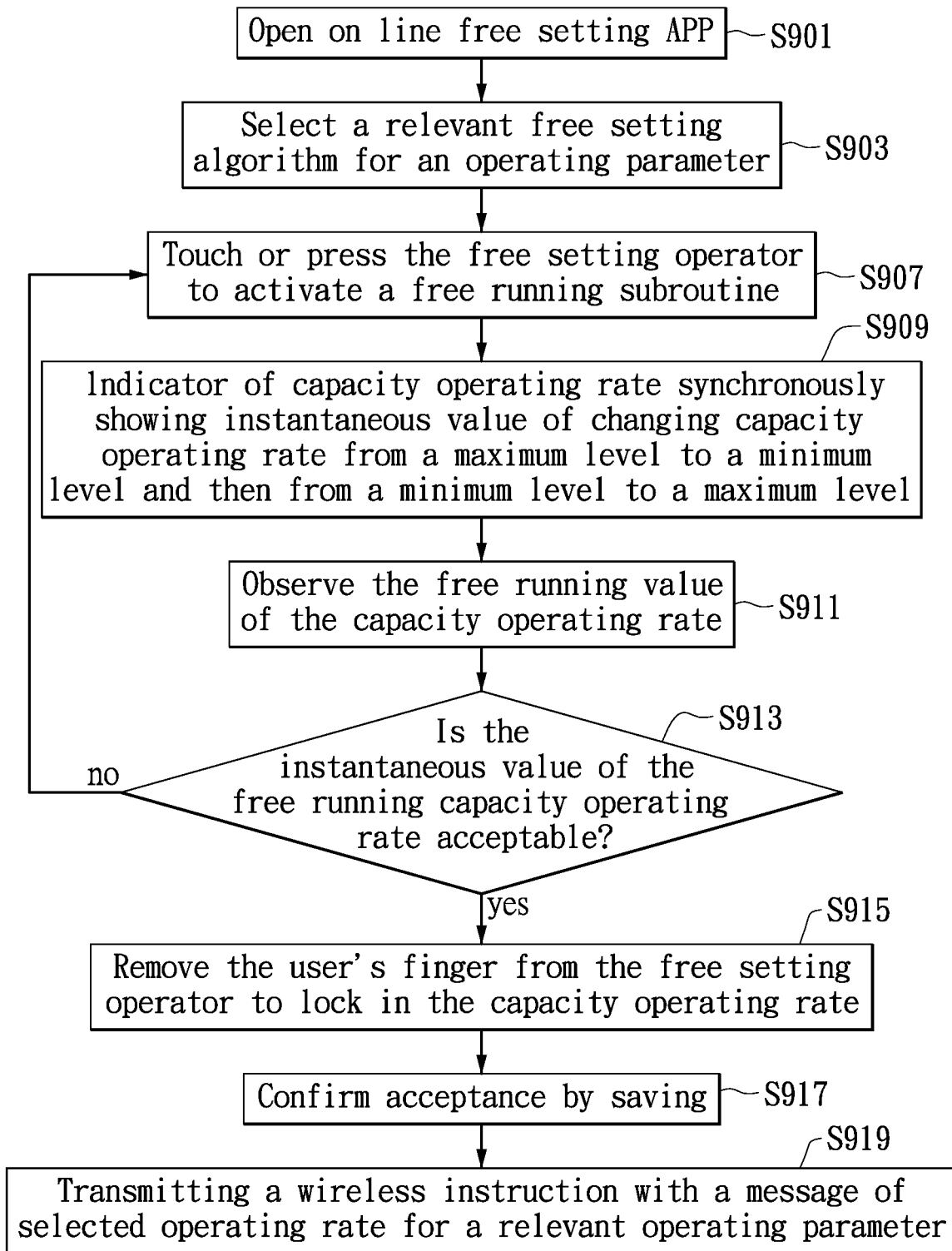


FIG. 10A

U.S. Patent

May 26, 2020

Sheet 18 of 19

US 10,667,367 B2

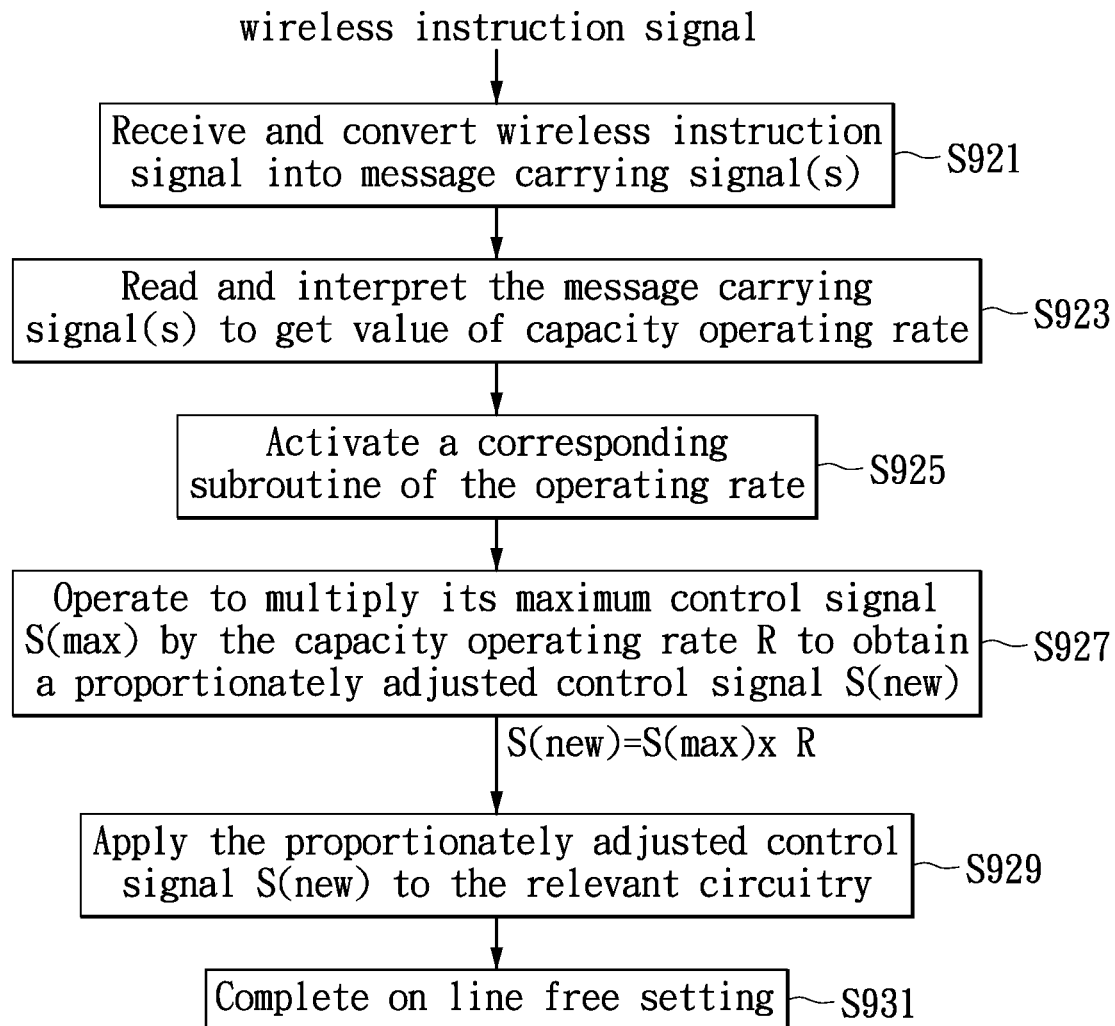


FIG. 10B

U.S. Patent

May 26, 2020

Sheet 19 of 19

US 10,667,367 B2

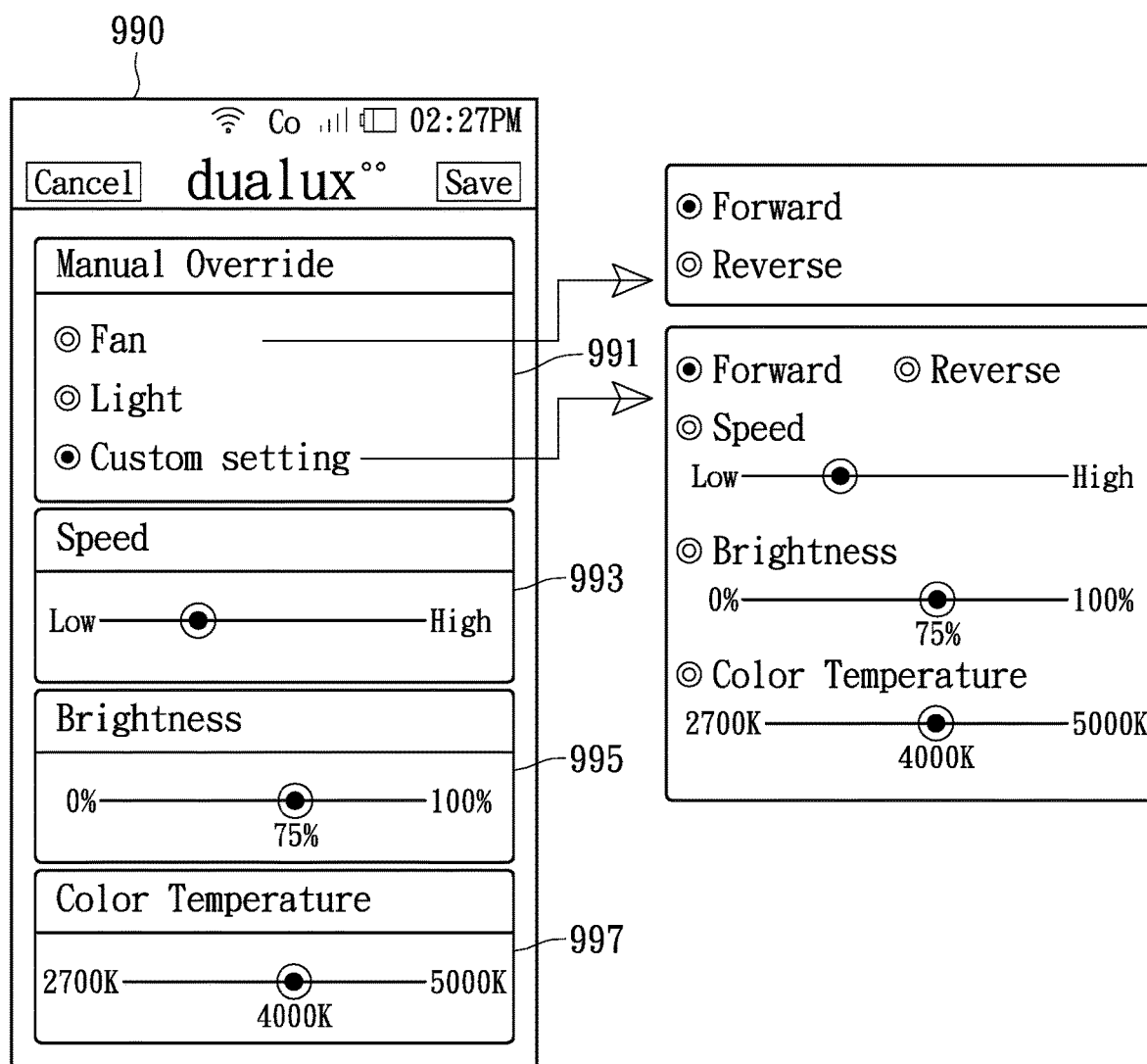


FIG. 11

US 10,667,367 B2

1

APP BASED FREE SETTING METHOD FOR SETTING OPERATING PARAMETER OF SECURITY LIGHT

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of Non-Provisional application Ser. No. 15/255,493 filed on Sep. 2, 2016, currently pending. The application Ser. No. 15/255,493 is a continuation-in-part of Non-Provisional application Ser. No. 15/072,602 filed on Mar. 17, 2016, now U.S. Pat. No. 9,560,719. The U.S. Pat. No. 9,560,719 is a continuation of Non-Provisional application Ser. No. 14/487,334 filed on Sep. 16, 2014, now U.S. Pat. No. 9,326,362. The U.S. Pat. No. 9,326,362 is a continuation-in-part of Non-Provisional application Ser. No. 13/222,090 filed on Aug. 31, 2011, now U.S. Pat. No. 8,866,392.

BACKGROUND

1. Technical Field

The present disclosure relates to a lighting apparatus, in particular, to a security light with sensors.

2. Description of Related Art

Lighting sources such as the fluorescent lamps, the incandescent lamps, the halogen lamps, and the light-emitting diodes (LED) are commonly found in lighting apparatuses for illumination purpose. Photo sensors are often utilized in outdoor lighting applications for automatic illuminations, known as the Photo-Control (PC) mode. Timers may be used in the PC mode for turning off the illumination or for switching to a lower level illumination of a lighting source after the lighting source having delivered a high level illumination for a predetermined duration, referred as the Power-Saving (PS) mode. Motion sensors are often used in the lighting apparatus for delivering full-power illumination thereof for a short duration when a human motion is detected, then switching back to the PS mode. Illumination operation controls such as auto-illumination in accordance to the background brightness detection, illumination using timer, illumination operation control using motion sensing results (e.g., dark or low luminous power to fully illuminated), and brightness control are often implemented by complex circuitries. In particular, the design and construction of LED drivers are still of a complex technology with high fabrication cost. With increasing popularity of mobile devices, there exists a good opportunity to elaborate operating functions of the external control unit installed with the motion sensing security light disclosed in U.S. Pat. No. 9,326,362 B2 by utilizing APP based remote control technology. The term APP is generally referred to an application program pre-loaded in a mobile device, such as in a smart cellular phone, for executing customer-designed functions by a user.

SUMMARY

An exemplary embodiment of the present disclosure provides a two-level LED security light with motion sensor which may switch to a second level illumination in the Power-Saving (PS) mode for a predetermined duration time when a human motion is detected thereby achieve warning purpose using method of electric current or lighting load

2

adjustment. Furthermore, prior to the detection of an intrusion, the LED security light may be constantly in a first level illumination to save energy, wherein the first level illumination may be a complete light off or a low level ambient light illumination.

An exemplary embodiment of the present disclosure provides a two-level LED security light, comprising a light emitting unit, a loading and power control unit, a photo sensor, a motion sensor, a power supply unit, and an external control unit coupled with the loading and power control unit. The light emitting unit comprises at least one LED, or the light emitting unit is a LED lamp. The loading and power control unit comprises a microcontroller or an application specific integrated circuit (ASIC) electrically coupled with a semiconductor switching device, wherein the semiconductor switching device is electrically connected in series with the power supply unit and the light emitting unit, wherein the microcontroller or ASIC, with program codes outputs a pulse width modulation (PWM) signal to control the conduction period T_{on} and the cut-off period T_{off} of the semiconductor switching device for delivering different average electric currents from the power supply unit to drive the light emitting unit for generating different illuminations, wherein the microcontroller or ASIC controls the semiconductor switching device respectively to have a first T_{on} and a second T_{on} of the conduction period such that the light emitting unit respectively generates a first level and a second level illumination characterized by light intensity and/or color temperature according to the signals received from the photo sensor and the motion sensor, wherein the external control unit is for setting illumination characteristics of at least one of the first level illumination and the second level illumination of the light emitting unit.

Another exemplary embodiment of the present disclosure provides a two-level security light control device applicable to AC lighting sources, comprising a power supply unit, a photo sensor, a motion sensor, a loading and power control unit, a zero-crossing detection circuit, a phase controller, and an external control unit coupled with the loading and power control unit. The phase controller is in-series connected to an AC lighting source and an AC power source, wherein the loading and power control unit comprises a microcontroller with program codes to control a conduction period of the phase controller thereby to adjust the average power of the AC lighting source, wherein when an ambient light detected by the photo sensor is lower than a predetermined value, the AC lighting source is turned on by the loading and power control unit thereby to generate a first level illumination and when the ambient light detected by the photo sensor is higher than the predetermined value, the AC lighting source is turned off by the loading and power control unit; when an intrusion is detected by the motion sensor, the loading and power control unit changes the average power of the AC lighting source and a second level illumination is generated for a predetermined duration, wherein the first level and the second level illumination are characterized by specific light intensity and/or color temperature, wherein the external control unit is for setting illumination characteristics of at least one of the first level illumination and the second level illumination of the light emitting unit.

Another one exemplary embodiment of the present disclosure provides a two-level security light control device applicable to AC lighting sources, comprising a power supply unit, a photo sensor, a motion sensor, a loading and power control unit, a zero-crossing detection circuit, a plurality of phase controllers, and an external control unit coupled with the loading and power control unit. The

US 10,667,367 B2

3

plurality of phase controllers are respectively series-connected to a plurality of alternating current (AC) lighting sources, wherein the pairs of phase controller-AC lighting source are parallel-connected to an AC power source, wherein the loading and power control unit comprises a microcontroller for writing operation program to respectively control conduction periods of the phase controllers thereby to respectively adjust the average powers of the AC lighting sources, wherein when an ambient light detected by the photo sensor is lower than a predetermined value, the AC lighting sources are turned on by the loading and power control unit to generate a first level illumination for a predetermined duration and when the ambient light detected by the photo sensor is higher than the predetermined value, the AC lighting sources are turned off, wherein when an intrusion is detected by the motion sensor, the loading and power control unit changes the average power of the AC lighting sources to generate a second level illumination for a predetermined duration, wherein the first level and the second level illumination are characterized by specific light intensity and color temperature, wherein the external control unit is for setting the illumination characteristics of at least one of the first level illumination and the second level illumination of the AC lighting sources.

Another one exemplary embodiment of the present disclosure represents a security light comprising a loading and power control unit connected with a wireless platform wherein system functions of an external control unit and a time setting unit are integrated and implemented by APP based technology to facilitate free setting operating parameters of a security light by a user on a wireless basis, wherein an indicator showing an instantaneous value of capacity operating rate is designed to facilitate the user's selection decision. In fact, the time setting unit disclosed in the U.S. Pat. No. 9,326,362 B2 & etc. as a separate component could have been included in the definition of the external control unit by its nature.

Another one exemplary embodiment of the present disclosure uses an APP based software technology to operate on line free settings of various operating parameters of a security light. The technology enables a user to observe and thereby arbitrarily select any level of an operating parameter in a designated category within its maximum circuitry capacity on an on line computing basis according to his or her observation by operating a free setting algorithm designed and loaded in a mobile device and the security light.

Another exemplary embodiment of the present disclosure is a user interface APP designed and loaded in a mobile device operable on the touch screen panel of the mobile device, wherein the APP operates to transform the user's setting decision(s) into operating variable(s) usable for processing, computing and setting the operating parameter(s) of the security light, wherein the operating variable(s) is wirelessly transmitted via the mobile device to the security light; wherein a software program is loaded in a microcontroller of the security light, comprising at least one subroutine programmed to use the value(s) of the operating variable(s) for computing, adjusting and setting at least one operating parameter of the security light.

Another exemplary embodiment of the present disclosure provides a user interface APP, designed on the touch screen panel of the mobile device, comprising at least one free setting algorithm for setting at least one operating parameter. The free setting algorithm is a capacity scale simulation implemented by a visual configuration of a free setting operator incorporated with a capacitor scale simulator and

4

the indicator of the capacity operating rate to facilitate the user's decision making process in setting a desired level of operating parameter, wherein when the free setting operator is activated by the user to interact with the capacity scale simulator, the user interface APP responsively manages to gradually adjust the value of the capacity operating rate according to the instantaneous state of interaction between the free setting operator and the capacity scale simulator with the indicator of the capacity operating rate simultaneously showing an instantaneous value of the capacity operating rate, wherein the capacity operating rate shown in the indicator can be an operating percentage or an actual operating value of the relevant operating parameter, wherein when a free setting motion of the free setting operator is ceased with at least one setting decision, the user interface APP manages to generate the operating variable(s) corresponding to the selection of the capacity operating rate(s) and accordingly operates to transmit a wireless instruction signal carrying a message of the operating variable to the lighting device.

In the present disclosure two types of capacity scale simulators are illustrated as exemplary embodiments; the first one is a virtual track and the second one is a capacity free running subroutine. When a virtual track is used as the capacity scale simulator, the free setting algorithm is implemented by a visual configuration of the free setting operator coupled with the virtual track and the indicator of the capacity operating rate, wherein the virtual track is designed on the touch screen panel of the mobile device in the relevant free setting algorithm, wherein the free setting operator is slidable by the user's finger along the virtual track with the indicator of the capacity operating rate simultaneously showing an instantaneous value of the changing capacity operating rate while the sliding motion of the free setting operator is being conducted, wherein the value shown in the indicator of the capacity operating rate can be an operating percentage or an actual operating value of the operating parameter, wherein the full length of the virtual track represents a simulation of the value of the maximum operating capacity of a relevant operating parameter characterized by a relevant circuitry, wherein the capacity operating rate is determined by a parking location of the free setting operator on the virtual track when the sliding motion stops. When the capacity scale simulator is a capacity free running subroutine with the free setting operator being a virtual button, the free setting algorithm is implemented by a visual configuration of the virtual button, the capacity free running subroutine integrated with the virtual button and the indicator of the capacity operating rate, wherein the virtual button is designed on the touch screen panel of the mobile device in the relevant free setting algorithm, wherein when the virtual button is continuously touched by a finger of the user, the user interface APP operates to activate the capacity free running subroutine to gradually increase the capacity operating rate from a minimum level to a maximum level and then from the maximum level to the minimum level to complete a full cycle of free running motion, wherein during a free running cycle period the instantaneous value of the changing capacity operating rate is simultaneously shown in the indicator of the capacity operating rate, wherein the value of capacity operating rate can be an operating percentage or an actual operating value of the operating parameter, wherein the moment at which the user's finger is removed from the virtual button, the capacity free running motion is instantly ceased with the capacity operating rate thereby being locked in at the instantaneous level of the last moment of the free running motion, wherein

US 10,667,367 B2

5

the time length of a half cycle period of the free running motion represents a simulation of the value of the maximum operating capacity of a relevant operating parameter characterized by a relevant circuitry, wherein the capacity operating rate is determined by the time length the user's finger staying in touch screen panel with the virtual button compared with the time length of a half cycle period of the free running motion.

The free setting algorithm of this embodiment is often used for setting time duration related operating parameters such as the light-on duration triggered by the motion sensor or triggered by the photo sensor, though it can also be used for sensitivity related operating parameters such as detection distance setting for the motion sensor or for the photo sensitivity settings. When the free setting operator determines a capacity operating rate according to the value shown in the capacity operating indicator, a wireless instruction signal carrying the message of the selected capacity operating rate coded with a category of the operating parameter is thereby transmitted by the APP software via a wireless transmission means (Wi-Fi, Blue Tooth, Zig Bee or Radio Frequency) of the mobile device, upon receiving such wireless signal(s) carrying the message of the selected capacity operating rate coded with a category of the operating parameter from the wireless receiver of the security light, the microcontroller with APP software responsively activates a corresponding subroutine to interpret, compute and convert the capacity operating rate into a proportionate time duration value and output a time delay control signal to control the duration of delay time selected by the end user. The confirmation of each selection of capacity operating rate can be done at the time when all relevant capacity operating rates of all categories of operating parameters are completely set and one confirmation by a touch on a confirmation button will simultaneously send all wireless signals carrying various operating rates coded with different operating parameters. Additionally only one value of each operating parameter computed by the microcontroller is retained and stored in a memory of the microcontroller for repetitive performance until a resetting of at least one operating parameter is initiated by the user then the specific category of operating parameter(s) will be replaced with newly computed value(s).

Another one exemplary embodiment of the present disclosure, wherein the operating parameters comprise setting of timer for performing a manual override illumination triggered by the photo sensor, setting of time length of light-on duration triggered by the motion sensor, setting of illumination level triggered by the photo sensor, setting of illumination level triggered by the motion sensor, setting of detection range of the motion sensor, setting of ambient illumination level at which the photo sensor operates to switch on the motion sensor or turn on the sensing security light or alternatively switching the performance state of the security light alternately between a motion sensing security mode and a general illumination mode.

In summary the present disclosures are a continuation of technology enhancement to elaborate operating functions of the external control unit installed with the motion sensing security light disclosed in former applications with a focus on an APP based new remote control technology usable for setting operating parameters of a lighting device. The present invention is applicable to a general lighting device, a single level security light, two level security light or multi-level/life style security light. The lighting load can be a non-linear lighting load such as LED lamp, a linear load such as halogen lamp or any electrically energize-able light emitting material. For single level security light, the motion

6

sensor is switched on at dusk by the photo sensor with the light remaining off, wherein when a motion intrusion is detected by the motion sensor, the light is instantly turned on for a short time duration and in the absence of continued motion intrusion(s) detected the light is then turned off. For the two level security light, the motion sensor is switched on at dusk and at the same time the light is turned on to perform a low level illumination mode, wherein when a motion intrusion is detected by the motion sensor, the light is instantly managed to change from a low level illumination mode to a high level illumination mode for a short time duration before being switched back to the low level illumination mode, the light is automatically switched off at dawn by the photo sensor. For the multi-level/life style security light, the light is automatically turned on at dusk to perform a first level illumination mode for a first predetermined duration and then is switched to a low level illumination mode, wherein when a motion intrusion is detected, the light is instantly managed to perform a high level illumination mode for a second predetermined duration, in the absence of further motion(s) detected, the light is then switched back to the low level illumination mode till at dawn the photo sensor manages to turn off the light and to disconnect the motion sensor.

In order to further understand the techniques, means and effects of the present disclosure, the following detailed descriptions and appended drawings are hereby referred, such that, through which, the purposes, features and aspects of the present disclosure can be thoroughly and concretely appreciated; however, the appended drawings are merely provided for reference and illustration, without any intention to be used for limiting the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings are included to provide a further understanding of the present disclosure, and are incorporated in and constitute a part of this specification. The drawings illustrate exemplary embodiments of the present disclosure and, together with the description, serve to explain the principles of the present disclosure.

FIG. 1 schematically illustrates a block diagram of a LED security light in accordance with an exemplary embodiment of the present disclosure.

FIG. 2A illustrates a schematic diagram of a LED security light in accordance to the first exemplary embodiment of the present disclosure.

FIG. 2B graphically illustrates a timing waveform of a pulse width modulation (PWM) signal in accordance to the first exemplary embodiment of the present disclosure.

FIG. 2C illustrates in some detail a schematic diagram of a LED security light of FIG. 2A.

FIG. 2D illustrates a flow chart of a free running setting method in accordance to the first exemplary embodiment of the present disclosure.

FIG. 3A illustrates a schematic diagram of a LED security light in accordance to the second exemplary embodiment of the present disclosure.

FIG. 3B illustrates a timing waveform of a LED security light in accordance to the second exemplary embodiment of the present disclosure.

FIG. 4 illustrates a schematic diagram of a LED security light in accordance to the second exemplary embodiment of the present disclosure.

FIG. 5 illustrates a block diagram of a mobile device for wirelessly controlling the security light of the present disclosure.

US 10,667,367 B2

7

FIG. 6A illustrates a block diagram of the mobile device loaded with an APP software for wirelessly controlling the security light of the present disclosure.

FIG. 6B illustrates a block diagram of the security light for wirelessly receiving instruction from the mobile device loaded an APP software for free setting of operating parameter(s).

FIG. 7 illustrates a first user interface APP with virtual track configuration designed and loaded in a mobile device for operating free settings of various operating parameters according to the present disclosure.

FIGS. 7A, 7B, 7C, 7D, 7E, 7F and 7G illustrate virtual track configuration of the free setting algorithm for free setting various operating parameters of the security light, respectively.

FIG. 8A illustrates a first embodiment of an operating flow chart of the APP based free setting algorithm loaded in a mobile device for operating a free setting operator to slide along the virtual track of a capacity operating scale for selecting and wirelessly transmitting an operating variable.

FIG. 8B is the first embodiment of an operating flow chart for receiving wireless instruction of operating variable and activating a relevant subroutine of the APP based free setting algorithm loaded in the security light for processing or computing operating variable(s) received from the mobile device.

FIG. 9 schematically illustrates a second user interface APP with virtual button configuration designed and loaded in a mobile device operable on the touch screen panel of the mobile device for operating free settings of various operating parameters using free running subroutines to help a user to set various operating parameters.

FIG. 9A schematically illustrates the free setting algorithm for selecting a capacity operating rate of motion delay time by continuously pressing a virtual push button and observing the changing value of the indicator.

FIG. 9B schematically illustrates an exemplary embodiment of the free setting algorithm for selecting a capacity operating rate of high level brightness by continuously pressing a virtual push button, observing the changing value of the indicator and choosing an instantaneous value shown in the indicator.

FIG. 10A illustrates a second embodiment of an operating flow chart of an APP based free setting algorithm loaded in a mobile device for operating a free running subroutine to select a desired operating variable by the user.

FIG. 10B illustrates the second embodiment of an operating flow chart for receiving wireless instruction of operating variable and activating a relevant subroutine of the APP based free setting algorithm loaded in the security light for processing or computing operating variable(s) received from the mobile device.

FIG. 11 illustrates another embodiment of the on line free setting algorithms of the present disclosure applied to a ceiling fan with light kit to control fan speed, fan rotation direction, light intensity and light color temperature.

DESCRIPTION OF THE EXEMPLARY EMBODIMENTS OF THE SUPPLEMENT

Reference is made in detail to the exemplary embodiments of the present disclosure, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers are used in the drawings and the description to refer to the same or alike parts.

Refer to FIG. 1, which schematically illustrates a block diagram of a security light. A security light (herein as the

8

lighting apparatus) 100 includes a power supply unit 110, a photo sensor 120, a motion sensor 130, a loading and power control unit 140, a light emitting unit 150, a time setting unit 160 and an external control unit 170. The power supply unit 110 is used for supplying power required to operate the system, wherein the associated structure includes the known AC/DC power converter. The external control unit 170 is coupled with the loading and power control unit 140, wherein the external control unit 170 can be manipulated by the user for adjusting illumination characteristics of at least one of a first level illumination and a second level illumination of the light emitting unit 150. The first level and the second level illumination are characterized by light intensity and/or color temperature. For example, the first level illumination and the second level illumination may be a low level illumination (or no illumination) and a high level illumination respectively, but the present disclosure is not so restricted. In other embodiment, the first level illumination may be a first color temperature level illumination, and the second level illumination may be a second color temperature level illumination. The photo sensor 120 may be a photo-resistor, which may be coupled to the loading and power control unit 140 for determining daytime or nighttime in accordance to the ambient light. The motion sensor 130 may be a passive infrared ray sensor (PIR), a microwave motion sensor or an ultrasonic motion sensor, which is coupled to the loading and power control unit 140 and is used to detect motion intrusions. When a person is entering a predetermined detection zone of the motion sensor 130, a sensing signal thereof is responsively transmitted to the loading and power control unit 140.

The loading and power control unit 140 comprises a controller circuitry which may be implemented by a micro-controller, a microprocessor, an ASIC (application specific integrated circuit) or a programmable integrated circuit coupled to the light emitting unit 150. The loading and power control unit 140 controls the illumination levels of the light emitting unit 150 in accordance to the sensing signal(s) outputted by the photo sensor 120 and the motion sensor 130. The light emitting unit 150 includes a plurality of LEDs and switching components. The loading and power control unit 140 may control the light emitting unit 150 to generate different levels of illumination modes. The time setting unit 160 coupled with the loading and power control unit 140 is used to preset various specific time durations respectively for different illumination modes of the light emitting unit 150. The time setting unit 160 is effectively a type of external control device which could be combined and considered as a component of the external control unit 170.

For a single level LED security light wherein when an ambient light detected by the photo sensor 120 is lower than a predetermined value, the loading and power control unit 140 manages to switch on the motion sensor 130, wherein when the ambient light detected by the photo sensor 120 is higher than a predetermined value, the loading and power control unit 140 thereby manages to switch off the motion sensor 130, wherein when a motion intrusion is detected by the motion sensor 130, the loading and power control unit 140 responsively manages to turn on the light emitting unit 150 to perform a high level illumination mode for a predetermined short time duration and then operates to turn off the light emitting unit 150 in the absence of any more motion intrusion;

For a two-level LED security light, wherein when the ambient light detected by the photo sensor 120 is lower than a predetermined value the loading and power control unit 140 operates to turn on the light emitting unit 150 to

US 10,667,367 B2

9

generate a low level illumination mode, wherein when the ambient light detected by the photo sensor **120** is higher than a predetermined value (i.e., dawn), the loading and power control unit **140** turns off the light emitting unit **150**, wherein when a human motion is detected by the motion sensor **130**, the loading and power control unit **140** manages to increase the electric current which flows through the light emitting unit **150**, to generate a high level illumination for a short predetermined duration preset by the time setting unit **160**. After the short predetermined duration, the loading and power control unit **140** may automatically reduce the electric current that flows through the light emitting unit **150** thus to have the light emitting unit **150** return to low level illumination for saving energy.

For a multi-level/life style LED security light, wherein when the photo sensor **120** detects that the ambient light is lower than a predetermined value (i.e., nighttime), the loading and power control unit **140** operates to turn on the light emitting unit **150** to generate a first level illumination mode for a first predetermined duration preset by the time setting unit **160** and is then switched to a second level illumination mode with a lower light intensity, wherein when the photo sensor **120** detects that the ambient light is higher than a predetermined value (i.e., dawn), the loading and power control unit **140** manages to turn off the light emitting unit **150**, wherein when the motion sensor **130** detects a human motion, the loading and power control unit **140** manages to increase the electric current which flows through the light emitting unit **150**, to generate a high level illumination for a second predetermined duration with relatively shorter time length preset by the time setting unit **160** and after the second predetermined duration, the loading and power control unit **140** automatically reduces the electric current that flows through the light emitting unit **150** thus to let the light emitting unit **150** return to the second level illumination mode for saving energy.

Refer to FIG. 2A in view of FIG. 1, FIG. 2A illustrates a schematic diagram of a two-level LED security light in accordance to the first exemplary embodiment of the present disclosure. The photo sensor **120** may be implemented by a photo sensor **220**; the motion sensor **130** may be implemented by a motion sensor **230**; the loading and power control unit **140** may be implemented by a microcontroller **240** may output a pulse width modulation (PWM) signal, wherein, not depicted explicitly in FIG. 2A, the PWM signal may be outputted and sent through a buffer component or a conditioner circuitry to the gate of transistor **Q1**; the time setting unit **260** is the time setting unit **160**; and the external control unit **270** is the external control unit **170**. The light emitting unit **250** includes three series-connected LEDs **L1-L3**. The LEDs **L1-L3** is connected between a DC source and a transistor **Q1**, wherein an artisan of ordinary skill in the art will appreciate how to replace the transistor **Q1** by other type of the semiconductor switching device. The DC source may be provided by the power supply unit **110**. The transistor **Q1** may be an N-channel metal-oxide-semiconductor field effect transistor (NMOS). The transistor **Q1** is connected between the three series-connected LEDs **L1-L3** and a ground **GND**. The loading and power control unit **140** implemented by the microcontroller **240** may output a pulse width modulation (PWM) signal to control the average electric current of the LEDs **L1-L3**. It is worth to note that the electric components depicted in FIG. 2A only serves as an illustration for the exemplary embodiment of the present disclose and hence the present disclosure is not limited thereto. The external control unit **270** may be an electronic switch being optionally a push button, a touch panel or an

10

infrared ray sensor for inputting voltage signal to adjust illumination characteristics of at least one of the first level illumination and the second level illumination of the light emitting unit. Further, in another embodiment, the external control unit **270** may be a push button, a touch panel, an infrared ray sensor or a wireless remote control device coupled or wirelessly linked to a pin of the microcontroller of the loading and power control unit; wherein, when the push button, the touch panel, the infrared ray sensor or the remote control device is activated, a voltage signal is generated to trigger the microcontroller **240** for performing at least one of the two functional modes, for instance the manual setting and the free-running setting (which would be explained thereafter) of the illumination characteristics. The external control unit **270** may be electrically coupled to the microcontroller **240** (that is the loading and power control unit **140**), such as utilizing electrical connection through conducting wire. In other embodiment, the external control unit **270** may be a remote control device, thus the external control unit **270** is wirelessly linked to the microcontroller **240** by using wireless techniques.

In addition, the microcontroller **240** is coupled to a time setting unit **260**, wherein the time setting unit **260** may allow the user to configure on software base a virtual timer embedded in the microcontroller **240** for executing a sub-routine for a predetermined duration to perform the first level or the second level illumination respectively in the PC mode or in the PS mode. Further, if the microcontroller **240** is coupled to a clock device, the time setting unit **260** may allow the user to set a clock time point instead of a predetermined duration for switching from the PC mode to the PS mode. However, the present disclosure is not limited thereto.

Refer to FIG. 2B concurrently, which graphically illustrates a timing waveform of a pulse width modulation (PWM) signal in accordance to the first exemplary embodiment of the present disclosure. In the PC mode, the PWM signal may be used to configure the transistor **Q1** to have the conduction period T_{on} being longer than the cut-off period T_{off} . On the other hand, in the PS mode, the PWM signal may configure the transistor **Q1** to have the conduction period T_{on} being shorter than the cut-off period T_{off} . In comparison of the illumination levels between the PC and PS modes, as the conduction period T_{on} of transistor **Q1** being longer under the PC mode, therefore have higher average electric current driving the light emitting unit **250** thereby generate high illumination, which may be classified as the high level illumination; whereas as the conduction period T_{on} of transistor **Q1** is shorter in the PS mode, therefore have lower average electric current driving the light emitting unit **250** thereby generate low illumination, which may be classified as the low level illumination.

The microcontroller **240** turns off the light emitting unit **250** during the day and activates the PC mode at night by turning on the light emitting unit **250** to generate the high level illumination for a short predetermined duration then return to the low level illumination thereby entering the PS mode. When the motion sensor **230** detects a human motion in the PS mode, the light emitting unit **250** may switch to the high level illumination for illumination or warning application. The light emitting unit **250** may return to the low level illumination after maintaining at the high level illumination for a short predetermined duration to save energy.

Please refer to FIG. 2A to further elucidate illumination level adjustment or setting. In order to adjust the illumination level of the light emitting unit **250**, two exemplary control methods are applied by utilizing the external control

US 10,667,367 B2

11

unit 270. Specifically, the first exemplary method is a manual adjustment applicable when the loading and power control unit 240 executes the Power-Saving (PS) mode for generating a first level illumination. The first level illumination is preferred an illumination of low light intensity and/or low color temperature. Refer to FIG. 2A again, the microcontroller 240 may scan with its program codes a pin connected with the external control unit 270 and may detect control signal generated from the external control unit 270. The external control unit 270 may be preferable a push button. When the push button is pressed down by a user to ground the connecting pin of the microcontroller 270, a zero voltage is generated for a time duration until the push button is released, such that a control signal with a zero voltage of a time duration is generated manually by the user. The microcontroller 240 with program codes recognizes this control signal and by executing a subroutine generates a PWM signal to cause a conduction time period T_{on} periodically varying within a preset range of 0 to 50% duty (T_{on} is equal to T_{off}) for a time length controlled by the external control unit 270, such that the LEDs 250 generate illumination with light intensity level gradually and periodically increasing from zero to 50% of the maximum light intensity and then decreasing from 50% to zero to complete a repetitive cycle. The time length of such periodical illumination variation is equal to the time duration of zero voltage generated by pushing down the push button 270. Only when the push button 270 is released by the user, the periodical illumination variation is ended at an illumination level related to a specific T_{on} value determined by the user; then the microcontroller 240 jumps out of the subroutine of periodical illumination variation and stores thereafter the corresponding T_{on} value of the PWM signal in its memory to update a data base for generating a new first level illumination in the PS mode. In brief, by pressing down and releasing the push button 270 connected with a pin of the microcontroller 240, the illumination level of the light emitting unit 250 can be thus set manually by the user when the loading and power control unit 240 executes the PS mode. However, the present disclosure is not limited thereto.

The second exemplary method is a free-running setting by program codes of microcontroller in conjunction with the external control unit. Refer to FIG. 2A. When the lighting apparatus is turned on by the photo sensor 220, the microcontroller 240 starts its program codes by executing a subroutine in which PWM signal is generated with the conduction time period T_{on} periodically varying within a preset range of 0 to 50% duty for a fixed time period, such that the LEDs 250 generate illumination with light intensity level gradually and periodically increasing from zero to 50% of the maximum light intensity and then decreasing from 50% to zero light intensity to complete a variation cycle. This periodical variation of the low illumination level can last freely for two or three cycles within the fixed time period which is preferable to be one minute. However, it is not to limit the present invention in this manner. Within the one-minute fixed time period, for instance, the periodical illumination variation may be ended by activating the external control unit 270. The external control unit 270 may be preferable a push button. When the push button is pressed down instantly by a user to ground the connecting pin of the microcontroller 270, a zero voltage is generated to trigger the microcontroller 240 wherein the microcontroller 240 jumps out of the subroutine to terminate the free-running illumination variation and stores the T_{on} value of PWM signal corresponding to the time point when the external control unit 270 being activated. The stored T_{on} value is used

12

to update a data base for generating the first level illumination in the PS mode. The free-run of periodical illumination variation may automatically end when the one-minute fixed time period expires with the external control unit 270 not being operated by the user; in this case, the microcontroller 240 jumps out of the subroutine of free-run and acquires from its memory a preset or earlier T_{on} value of PWM signal for generating the first level illumination in the PS mode until the lighting apparatus is turned off.

In brief, in a preferred embodiment of the present disclosure, a two-level LED security light may include a power supply unit, a photo sensor, a motion sensor, a loading and power control unit, a light emitting unit, a time setting unit and an external control unit. The external control unit is provided for adjusting or setting illumination level of LED light. The loading and power control unit is implemented by a microcontroller with program codes to operate the two-level LED security light. The microcontroller turns off the light emitting unit during the day and activates a Power-Saving (PS) mode at night by turning on the light emitting unit to generate a first level illumination, and upon human motion detection by switching the light emitting unit to generate a second level illumination for a short time duration. The illumination characteristics of first level illumination can be changed by activating the external control unit according to the user's demand. When the lighting apparatus is turned on, the microcontroller starts its program codes by firstly executing a subroutine with free-run for a fixed time length, such that the user can follow the gradual and periodical illumination variation to select an illumination level by operating the external control unit; thereafter, the microcontroller jumps out of the subroutine of free-run and executes the program codes of PS mode for generating the first level illumination with the selected level characteristics until the lighting apparatus is turned off. If within the fixed time length of free-run the external control unit is not activated, the microcontroller jumps out of the subroutine of free-run automatically and, with a data base of a preset or earlier level characteristics, executes program codes of PS mode for generating the first level illumination until the lighting apparatus is turned off. The level characteristics can also be further adjusted manually by the user when the loading and power control unit executes the PS mode. The external control unit may be preferable a push button. When in PS mode the light emitting unit generates a first level illumination, the user can press the push button for a while to observe the gradual and periodical changing of level characteristic, and then decide at a time point to release the push button to select a desired illumination level, such that to complete manual adjustment.

Please refer to FIG. 2C in view of FIG. 2A and FIG. 2B. Two preferred constructions respectively for the time setting unit 260' and the external control unit 270' are shown in FIG. 2C. The time setting unit 260' may be a voltage divider with variable resistor for setting predetermined time durations for the first level and the second level illumination. The external control unit 270' may include a voltage divider 270a which may comprise a variable resistor provided with a rotating knob to facilitate operation. For illumination level setting, the microcontroller operates with program codes preferably in conjunction with the voltage divider 270a and further with a power supply detection circuit 270b, an energy storage capacitor 270c and a power switch (not shown in FIG. 2C) for respectively manual and free-running setting of at least one of a first level illumination and a second level illumination of the two-level LED security light; details of

US 10,667,367 B2

13

adjusting illumination level with the external control unit 270' and other extra devices will be described later.

In order to adjust the illumination level of the light emitting unit 250, two exemplary control methods are applied by utilizing the external control unit 270a and the software technique incorporating with extra devices 270b-270c. Specifically, the first exemplary method is a manual adjustment applicable in the Power-Saving (PS) mode for generating a first level illumination. Refer to FIG. 2C again, the microcontroller 240 may scan with its program codes the voltage on a pin connected with the voltage divider 270a and may detect a voltage, in which the voltage across of the variable resistor (voltage divider 270a) may be varied manually when a user rotates the knob attached on the variable resistor (voltage divider 270a). The microcontroller 240 with program codes generates in response a PWM signal to cause a conduction time period T_{on} proportional to a voltage received from the variable resistor (voltage divider 270a). The light emitting unit 250 illuminates accordingly with light intensity level characterized by the conduction time period T_{on} , controlled by the voltage of the variable resistor (voltage divider 270a). With the external control unit 270', the first illumination level of the light emitting unit 250 can be thus set manually by tuning the variable resistor (voltage divider 270a) when the loading and power control unit 240 executes the PS mode.

The second exemplary method is a free-running adjustment based on program codes of microcontroller in conjunction with a power supply detection circuit and an energy-stored capacitor. Refer to FIG. 2C, when the lighting apparatus is turned on, the microcontroller 240 starts its program codes firstly by executing a subroutine of free-run in which PWM signal is generated to cause the conduction time period T_{on} periodically varying within a preset range of 0 to 50% duty for a fixed time period, such that the LEDs 250 generate illumination with light intensity level gradually and periodically increasing from zero to 50% of the maximum light intensity and then decreasing from 50% to zero to complete a variation cycle. This periodical variation of the low illumination level can last freely for two or three cycles within the fixed time period which is preferable to be one minute. However, it is not to limit the present invention in this manner. Within the one-minute fixed time period, for instance, the free-run of periodical illumination variation may be overridden by the user by turning off a power switch momentarily (for 1-2 seconds) and then switching it back on. At the moment when the power switch is turned off and then switched back on, the microcontroller 240 detects this OFF-ON event through a power supply detection circuit 270b and leaves the subroutine to terminate free-run, and simultaneously stores the T_{on} value of PWM signal related to the time point of the OFF-ON event to update a data base for generating the first level illumination in the PS mode. In general, the user can follow the gradual and periodical free-run of the low level lighting variation and select a favorable light intensity level by promptly turning the power switch off and again on (short power interruption). After overriding by power interruption, the microcontroller 240 jumps out of the subroutine of free-run and continues its program codes to execute the PS mode in which the illumination level is determined by the user. The free-run of periodical lighting variation may end automatically when the fixed time period expires with power interruption not being detected; the microcontroller 240 jumps out of the subroutine of free-run and acquires from its memory a preset or earlier T_{on} value of PWM signal for generating the first level illumination in the PS mode. Refer to FIG. 2C again,

14

an energy storage capacitor 270c is connected between the high end and the ground of the working voltage V_{DD} . This capacitor 270c is for holding the voltage V_{DD} to keep the circuits 240, 270b still working when electric power is interrupted for 1-2 seconds. Therefore, when overriding free-run by short power interruption, an instant zero voltage is detected by the power supply detection circuit 270b and recognized by the microcontroller 240 to perform function for selecting and setting a desired illumination level.

In another embodiment, refer to FIG. 1 again, when an ambient light detected by the photo sensor 120 is lower than a predetermined value, the light emitting unit 150 may be turned on thereby by the loading and power control unit 140 to generate an adjustable level illumination for a first predetermined duration and then turned off or switched to a low level illumination, when an intrusion is detected by the motion sensor 130, the light emitting unit 150 is turned on by the loading and power control unit 140 to generate a high level illumination for a second predetermined duration and then turned off or switched to a low level illumination until the next intrusion detection; when an ambient light detected by the photo sensor 120 is higher than the predetermined value, the light emitting unit 150 is turned off by the loading and power control unit. The time setting unit 160 is used to set the first and the second predetermined duration respectively for the adjustable level illumination and the high level illumination. The external control unit 170 is used in two setting modes for setting illumination characteristics of the adjustable level illumination; wherein the first setting mode is a manual setting, in which the illumination level of the light emitting unit is set in a preset range by activating the external control unit 170; wherein the second setting mode is a free-running setting, in which the light emitting unit performs a free-run of the adjustable level illumination with light intensity gradually and periodically increasing and then decreasing in a preset range to complete a cycle, wherein the free-run may be terminated by activation of the external control unit 170 at a time point corresponding to a specific light intensity level, such that the light emitting unit performs the adjustable level illumination constantly with the specific light intensity level being set thereof.

In still another embodiment, a lighting management device is provided. Refer to FIG. 1 again, the lighting management device applicable to a lighting load such as the light emitting unit 150. The lighting management device comprises the loading and power control unit 140, the power supply unit 110 and the external control unit 170 coupled with the loading and power control unit. The loading and power control unit 140 comprises a microcontroller (such as the microcontroller 240 shown in FIG. 2A) electrically coupled with a semiconductor switching device (such as the transistor Q1 shown in FIG. 2A). The external control unit 170 may be a push button, a touch panel, an infrared ray sensor or a remote control device coupled or wirelessly linked to a pin of the microcontroller. The semiconductor switching device is electrically connected in series with the power supply unit and the lighting load, such as the transistor Q1 is electrically connected in series with the DC source and the LEDs of the light emitting unit 250, wherein the microcontroller with written program code controls the conduction rate of the semiconductor switching device, wherein the external control unit 170 enables a user to select a desired illumination characteristic during a free running setting process performed by the lighting load, wherein the lighting load operates a free-run of illumination level by gradually and periodically changing the illumination characteristic, wherein the free-run may be terminated by acti-

US 10,667,367 B2

15

vation of the external control unit **170** at a time point corresponding to a specific illumination characteristic selected by the user, wherein the microcontroller accordingly interprets the conduction rate of the semiconductor switching device at the time point when the external control unit **170** is activated and the free running is terminated to be the illumination characteristic set for illumination performance, the illumination characteristic is then memorized by the microcontroller for repetitive performance. Further, in one embodiment, the free run setting is terminated and the illumination characteristic of the lighting load is set by turning off a power switch instantly and turning it back on at the time point the lighting load performs a desired lighting characteristic selected by the user.

According to the previous embodiment, a free running setting method with activation of external control unit or through power switch interruption is provided. Refer to FIG. 2D, the method comprises step **S110**: selecting a desired illumination characteristic during a free running setting process performed by the lighting load by an the external control unit; **S120**: utilizing the lighting load to operate a free-run of illumination level by gradually and periodically changing the illumination characteristic; and **S130**: terminating the free-run by activating of the external control unit or through power switch interruption at a time point corresponding to a specific illumination characteristic selected by the user, wherein the microcontroller accordingly interprets the conduction rate of the semiconductor switching device at the time point when the external control unit is activated or a power switch interruption is detected and the free running is terminated to be the illumination characteristic set for illumination performance, the illumination characteristic is then memorized by the microcontroller for repetitive performance.

In summary, in a preferred embodiment of the present disclosure, a two-level LED security light may employ an external control unit coupled to a loading and power control unit for adjusting or setting the illumination level of the LED light. The external control unit may be a push button, a voltage divider, a touch panel, an infrared ray sensor or other devices for generating control signals having different attributes depending on the category of the external control unit. For instance, a push button generates a binary signal having a zero voltage lasting for a time length equal to the time duration while the push button being pushed down; quite different, a voltage divider generates a DC voltage tuned by rotating a rotary knob attached to the voltage divider. The loading and power control unit may be implemented by a microcontroller with program codes designed respectively accommodating to different control signals of different attributes for generating PWM signal to cause T_{on} value variable according to the control signal attribute, such as to carry out illumination level adjustment or setting. The illumination level characteristics including light intensity and color temperature can be thus set by operating the external control unit.

Refer back to FIG. 1, wherein the light emitting unit **150** may include a phase controller and one or more parallel-connected alternating current (AC) LEDs. The phase controller is coupled between the described one or more parallel-connected ACLEDs and AC power source. The loading and power controller **140** in the instant exemplary embodiment may through the phase controller adjust the average power of the light emitting unit **150** so as to generate variations in the first level and the second level illuminations. Refer to FIG. 3A and FIG. 4 in conjunction with FIG. 1, this embodiment provides a two-level security light

16

control device applicable to AC lighting sources, comprising the power supply unit **110**, the photo sensor **120** (that is the photo sensor **220**), the motion sensor **130** (that is the motion sensor **230**), the loading and power control unit **140** (that is the microcontroller **240**), a zero-crossing detection circuit **453**, a plurality of phase controllers (one phase controller **452** shown in FIG. 3A and one phase controllers **551** shown in FIG. 4 are exemplary illustrated), the time setting unit **160** (that is the variable **260'**) and the external control unit **270'** coupled with the loading and power control unit **240**.

Refer to FIG. 3A, which illustrates a schematic diagram of a two-level LED security light **100** in accordance to the second exemplary embodiment of the present disclosure. The operation of the external control **270'** can be referred to FIG. 2C and the related description of manual and free-running setting of illumination level, and the earlier description thus the redundant information is not repeated. It is worth mentioning that the power supply detection circuit **270b** is implemented by the zero-crossing detection circuit **453**, and the power switch mentioned in the previous embodiment can be implemented by the power switch **160a** electrically coupled to the AC power source and the zero-crossing detection circuit **453**. For a two-level LED security light setting up at the ceiling or a high site far from the user, the free-run setting of the illumination level through instant power interruption by utilizing the power switch **160a** is very convenient for the user, in which no any added switching device is needed. The main difference between FIG. 3A and FIG. 2C is in that the light-source load is an ACLED, which is coupled to the AC power source, and further the light emitting unit **450** includes a phase controller **451**, for ease of explanation, but the present disclosure is not so restricted. The phase controller **451** is in-series connected to the AC lighting source (ACLED) and the AC power source, wherein the microcontroller **240** is for writing operation program to control a conduction period of the phase controller **451** thereby to adjust the average power of the AC lighting source (ACLED). In another embodiment, a plurality of phase controller **451** can be also controlled by the microcontroller **240**. The phase controller **451** includes a bi-directional switching device **452**, here, a triac, a zero-crossing detection circuit **453**, and a resistor R. The microcontroller **240** turns off the light emitting unit **450** when the photo sensor **220** detects that the ambient light is higher than a predetermined value. Conversely, when the photo sensor **220** detects that the ambient light is lower than the predetermined value, the microcontroller **240** activates the PC mode by turning on the light emitting unit **450**. In the PC mode, the microcontroller **240** may select a control pin for outputting a pulse signal which through a resistor R triggers the triac **452** to have a large conduction angle. The large conduction angle configures the light emitting unit **450** to generate a high level illumination for a predetermined duration. Then the microcontroller **240** outputs the pulse signal for PS mode through the same control pin to trigger the triac **452** to have a small conduction angle for switching the light emitting unit **450** from the high level illumination to the low level illumination of the PS mode. Moreover, when the motion sensor **230** (also called motion sensor) detects a human motion in the PS mode, the microcontroller **240** temporarily outputs the PC-mode pulse signal through the same control pin to have the light emitting unit **450** generated the high level illumination for a short predetermined duration. After the short predetermined duration, the light emitting unit **450** returns to the low level illumination.

In the illumination control of the ACLED, the microcontroller **240** may utilize the zero-crossing detection circuit

US 10,667,367 B2

17

453 to send an AC synchronized pulse signal thereof which may trigger the triac 452 of the phase controller 451 into conduction at a proper time point thereby to change the average power input to the light emitting unit 450. As the ACLED has a cut-in voltage V_i for start conducting, thus if the pulse signal inaccurately in time triggers the conduction of the triac 452, then the instantaneous value of AC voltage may be lower than the cut-in voltage V_i of ACLED at the trigger pulse. Consequently, the ACLED may result in the phenomenon of either flashing or not turning on. Therefore, the pulse signal generated by the microcontroller 240 must fall in a proper time gap behind the zero-crossing point associated with the AC sinusoidal voltage waveform.

Supposing an AC power source having a voltage amplitude V_m and frequency f , then the zero-crossing time gap t_D of the trigger pulse outputted by the microcontroller 240 should be limited according to $t_o < t_D < 1/2f - t_o$ for a light-source load with a cut-in voltage V_i , wherein $t_o = (1/2\pi f) \sin^{-1}(V_i/V_m)$. The described criterion is applicable to all types of ACLEDs to assure that the triac 452 can be stably triggered in both positive and negative half cycle of the AC power source. Take ACLED with $V_i(\text{rms})=80\text{V}$ as an example, and supposing the $V_m(\text{rms})=110\text{V}$ and $f=60\text{Hz}$, then $t_o=2.2\text{ms}$ and $(1/2f)=8.3\text{ms}$ may be obtained. Consequently, the proper zero-crossing time gap t_D associated with the phase modulation pulse outputted by the microcontroller 240 which lagged the AC sinusoidal voltage waveform should be designed in the range of $2.2\text{ms} < t_D < 6.1\text{ms}$.

Refer to FIG. 3B, which illustrates a timing waveform of the two-level LED security light in accordance to the second exemplary embodiment of the present disclosure. Waveforms (a)-(d) of FIG. 3B respectively represent the AC power source, the output of the zero-crossing detection circuit 453, the zero-crossing delay pulse at the control pin of the microcontroller 240, and the voltage waveform across the two ends of the ACLED in the light emitting unit 450. The zero-crossing detection circuit 453 converts the AC voltage sinusoidal waveform associated with the AC power source to a symmetric square waveform having a low and a high voltage levels as shown in FIG. 3B(b). At the zero-crossing point of the AC voltage sinusoidal wave, the symmetric square waveform may transit either from the low voltage level to the high voltage level or from the high voltage level to the low voltage level. Or equivalently, the edge of the symmetric square waveform in the time domain corresponds to the zero-crossing point of the AC voltage sinusoidal waveform. As shown in FIG. 3B(c), the microcontroller 240 outputs a zero-crossing delay pulse in correspondence to the zero-crossing point of the AC sinusoidal waveform in accordance to the output waveform of the zero-crossing detection circuit 453. The zero-crossing delay pulse is relative to an edge of symmetric square waveform behind a time gap t_D in the time domain. The t_D should fall in a valid range, as described previously, to assure that the triac 452 can be stably triggered thereby to turn on the ACLED. FIG. 3B(d) illustrates a voltage waveform applied across the two ends associated with the ACLED. The illumination level of the light emitting unit 450 is related to the conduction period t_{on} of the ACLED, or equivalently, the length t_{on} is directly proportional to the average power inputted to the ACLED. The difference between the PC mode and the PS mode being that in the PC mode, the ACLED has longer conduction period, thereby generates the high level illumination; whereas in the PS mode, the ACLED conduction period is shorter, hence generates the low level illumination.

18

Refer to FIG. 3A and FIG. 3B concurrently for setting ACLED illumination level. In manual setting, the microcontroller 240 with program codes controls the conduction time period t_{on} of the ACLED to be in a preset range $0 < t_{on} < 1/4f - t_o$; wherein by tuning the variable resistor (voltage divider 270a) the light intensity level of the ACLED can be adjusted between zero and 50% of the maximum light intensity. In the free-run setting of illumination level, the microcontroller 240 with program codes controls the conduction time period t_{on} of the ACLED to periodically change in a preset range $0 < t_{on} < 1/4f - t_o$, such that the ACLED generates illumination gradually and periodically increasing from zero to 50% and then decreasing from 50% to zero of the maximum light intensity. When following the free-run of lighting variation, the illumination level can be set through power interruption momentarily by utilizing the power switch 160a.

Refer to FIG. 4, which illustrates a schematic diagram of a two-level LED security light 100 in accordance to the second exemplary embodiment of the present disclosure. The operation of the external control 270' can be referred to FIG. 2C and the related description of manual and free-running setting of illumination level, and the earlier description thus the redundant information is not repeated. It is worth mentioning that the power supply detection circuit 270b is implemented by the zero-crossing detection circuit 554, and the power switch mentioned in the previous embodiment can be implemented by the power switch 160a electrically coupled to the AC power source and the zero-crossing detection circuit 554. The light emitting unit 550 of the lighting apparatus 100 includes an ACLED1, an ACLED2, and a phase controller 551. The phase controller 551 can be treated as two phase controllers 451 (shown in FIG. 3A) which are parallel-connected. In still another embodiment, a plurality of phase controllers (451 or 551) are respectively series-connected to a plurality of alternating current (AC) lighting sources (ACLED), wherein the pairs of phase controller-AC lighting source are parallel-connected to the AC power source. The phase controller 551 includes triacs 552 and 553, the zero-crossing detection circuit 554 as well as resistors R1 and R2. The light emitting unit 550 of FIG. 4 is different from the light emitting unit 450 of FIG. 3A in that the light emitting unit 550 has more than one ACLEDs and more than one bi-directional switching devices. Furthermore, the color temperatures of the ACLED1 and the ACLED2 may be selected to be different.

In the exemplary embodiment of FIG. 4, the ACLED1 has a high color temperature, and the ACLED2 has a low color temperature. In the PC mode, the microcontroller 240 uses the phase controller 551 to trigger both ACLED1 and ACLED2 to conduct for a long period, thereby to generate the second level illumination as well as illumination of mix color temperature. In the PS mode, the microcontroller 240 uses the phase controller 551 to trigger only the ACLED2 to conduct for a short period, thereby generates the first level illumination as well as illumination of low color temperature. Moreover, in the PS mode, when the motion sensor 230 detects a human motion, the microcontroller 240 may through the phase controller 551 trigger the ACLED1 and the ACLED2 to conduct for a long period. Thereby, it may render the light emitting unit 450 to generate the second level illumination of high color temperature and to produce high contrast in illumination and hue, for a short predetermined duration to warn the intruder. Consequently, the lighting apparatus may generate the first level or the second level illumination of different hue. The rest of operation theories associated with the light emitting unit 550 are

US 10,667,367 B2

19

essentially the same as the light emitting unit 450 and further descriptions are therefore omitted.

The present disclosures is a continuation of technology enhancement to elaborate operating functions of the external control unit 170 installed with the motion sensing security light 100 of FIG. 1 with a focus on an APP based new remote control technology usable for setting operating parameters of a motion sensing security light 100. The present invention is applicable to a general lighting device, a single level security light, a two level security light or a multi-level/life style security light and the lighting load can be a non-linear lighting load such as LED lamp, a linear load such as halogen lamp or any electrically energize-able light emitting material(s); wherein for single level security light the motion sensor 130 is switched on at dusk by the photo sensor 120 with the light emitting unit 150 remaining off, when a motion intrusion is detected by the motion sensor 130 the light emitting unit 150 is instantly turned on for a short time duration and in the absence of continued motion intrusion(s) detected the light emitting unit 150 is then turned off; wherein for the two level security light the motion sensor 130 is switched on at dusk and at the same time the light emitting unit 150 is turned on to perform a low level illumination mode, when a motion intrusion is detected by the motion sensor 130 the light emitting unit 150 is instantly managed to change from a low level illumination mode to a high level illumination mode for a short time duration before being switched back to the low level illumination mode, the light emitting unit 150 is automatically switched off at dawn by the photo sensor 120; wherein for the multi-level/life style security light the light emitting unit 150 is automatically turned on at dusk to perform a first level illumination mode for a first predetermined duration and then is switched to a low level illumination mode, when a motion intrusion is detected the light emitting unit 150 is instantly managed to perform a high level illumination mode for a second predetermined duration, in the absence of further motion(s) detected, the light emitting unit 150 is then switched back to the low level illumination mode till at dawn the photo sensor 120 manages to turn off the light emitting unit 150 and to disconnect the motion sensor 130.

In general, a security light 100 (as FIG. 1, herein as a lighting apparatus) may include a power supply unit 110, a photo sensor 120, a motion sensor 130, a loading and power control unit 140, a light-emitting unit 150, a time setting unit 160 and an external control unit 170. The loading and power control unit 140 may be implemented by a controller circuitry that includes a programmable device, such as a microcontroller, operating with software codes. In practice, the loading and power control unit 140 performs various operating modes of the security light 100 according to sensing signals received from the photo sensor 120 and the motion sensor 130. The time setting unit 160 and the external control unit 170 are used to adjust or set operating parameters of the loading and power control unit 140 for performing various operating modes. The current state of art provides inconvenient technology, for instance, using many push buttons and rotating knobs, for a user to set or adjust the operating parameters of a security light. It is hence highly recommended to develop user-friendly technology, for instance, wireless remote control technology, to facilitate the settings of a variety operating parameters of the security light 100.

The conventional wireless remote control technology has been in existence and used for operating electrical apparatuses such as TV sets, air-conditioners, ceiling fans integrated with light kits or lighting items for as many years as

20

we could possibly remember. The advantage of using a wireless remote control technology is the convenience of being able to locally control the various operating functions of the electrical apparatuses which are remotely located in high rise location or distant location "without needing to climb a ladder, lean out a window, reach down from roof, or engage in other inconvenient activities". Such advantage of local controllability is essentially the same for all home appliances with remote control devices though each electrical appliance may have some different operating parameters, the fundamental technologies to operate such different performance functions are of no differences.

One application of wireless technology to remotely modify or set operating parameters of a security light system can be found, for example, in U.S. Pat. No. 7,880,394 B2, which discloses an art of "Lighting Control System to Facilitate Remote Modification of A Fixture Modifiable Operating Parameter". The U.S. Pat. No. 7,880,394 B2 uses an external memory connected to a controller to store a database for each category of operating parameters, such that according to wireless instructions the controller performs simply a process of looking up the table, picking the selected datum from the table and executing the selected operating parameter. The options of each operating parameter are limited to the database pre-installed in the external memory.

In view of prevalent usage of mobile devices, such as smart phone, APP based method can be designed for free setting the operating parameters of a security light system, such that a more flexible, more convenient and more cost effective setting technology, other than what disclosed in U.S. Pat. No. 7,880,394 B2, can be provided.

Referring to FIG. 5 of an exemplary embodiment of the present disclosure, wherein an elaborated security light 500 is provided with a wireless receiver 590 to receive wireless instructions from a mobile device 600 for adjusting and setting various operating functions of the security light 500. The security light 500 has a similar system structure like the structure described in FIG. 1, except the time setting unit 160 and the external control unit 170 are now replaced by the wireless receiver 590, other circuitry components such as the power supply unit 510, the photo sensor 520, the motion sensor 530, the loading and power control unit 540 and the light emitting unit 550 remain unchanged. The wireless receiver 590 is used as a wireless platform for performing various external control functions such that cumbersome work of manual settings on a security light panel can be eliminated. The elaborated security light 500 is featured with a remote setting technology based on the wireless platform of the wireless receiver 590 to work together with an APP software pre-installed in a mobile device 600 to remotely adjust or modify control signal(s) required for performing various operating modes of the security light 500. The mobile device 600 is loaded with an APP (application program) for free setting the operating parameters for the security light 500. The mobile device 600 is implemented by a mobile phone, a pad, a PDA, a notebook or a remote controller. The type of mobile device 600 is not limited thereto. It will be understood that these embodiments are provided by way of example and that other counterpart components may be used as well to effect these teachings.

The present disclosure uses an APP based software technology to operate on line free settings of various operating parameters for a security light 500. The APP based technology enables a user to arbitrarily select "any level" of a relevant operating parameter. The operating parameter for instance can be a value of motion delay time, a value of

US 10,667,367 B2

21

sensitivity for photo sensor **520** or motion sensor **530**, a value of brightness or a mode of many time counting related, light intensity setting related, or distance setting related modes. The operating parameter is in a designated category of operating functions within a maximum circuitry capacity.

The present disclosure discloses an on line free setting method to enable an end user to set “any level” of operating parameter in each functional category, the word “any level” fundamentally precludes the possibility of employing conventional remote control technology which uses the pick and play method to alternately modify up to three level (high, medium and low) of operating parameters for operating the security light, such as disclosed in the prior art U.S. Pat. No. 7,880,394; wherein an external memory **104** is designed to store limited predetermined data for various values of operating parameters and a controller **101** simply follows instruction(s) of the wireless instruction played by a user to look up the table stored in the memory and pick the instructed datum/data for execution. Such technology of pick and play is relatively simple and straight forward.

The present disclosure of on line free setting method on the other hand requires a much more sophisticated technology for implementation because the free setting could lead to a large variation of instructions by the user while it is impossible or at least not cost effective for using a big memory to store a large data base for free selection. One better approach to fulfill a free setting capacity is to use an algorithm to compute user’s free setting decisions on an on line basis. In other words, the present disclosure is a compute and play method, and the external memory for operating pick and play method as disclosed in the prior art of U.S. Pat. No. 7,880,394 may be no longer needed.

Referring now to FIG. **6A**, the mobile device **600** generally comprises a processor, a memory and a transmitter. An APP based free setting algorithm is loaded into the memory. For example, when the user wants to adjust brightness of the security light **500**, the user uses the mobile device **600** with APP to transmit wireless instruction **609** by the transmitter **607**. The user opens the mobile device APP **601**, which is understood as a user interface APP, and selects one of many functional blocks available. The APP selected function block will accordingly call the relevant APP Subprogram **603** to show a free setting algorithm **605** on the screen of the mobile device **600**. The free setting algorithm **605** comprises a free setting operator, a virtual track coupled with the free setting operator and an indicator of capacity operating rate to provide instantaneous information of the changing capacity operating rate. The free setting algorithm **605** allows the user to select a capacity operating rate by finger sliding the free setting operator along the virtual track with the help of the indicator of capacity operating rate.

When a desired capacity operating rate of a relevant operating parameter of the security light **500** is determined by the user, the user interface APP **601** with free setting algorithm **605** manages to transmit a wireless instruction signal **609** carrying a message coded with selected capacity operating rate as an operating variable for a relevant operating parameter by transmitter **607** to the security light **500**. This transmitter **607** is configured and arranged to selectively transmit the aforementioned instructions for reception by the wireless receiver **590** of the security light **500**.

In simple term, the user interface APP **601** loaded in the mobile device **600** transforms a user’s setting decision into an operating variable of the operating parameter, wherein the operating variable is the capacity operating rate. The mobile device **600** wirelessly transmits wireless instruction **609** with an operating variable pertaining to a relevant

22

operating parameter to the security light **500**. The relevant program loaded in the security light **500** is activated to use the value of the operating variable for computing, adjusting and setting at least one operating parameter of the security light **500**. The security light **500** accordingly produces a relevant output based on the selected operating variable(s) of the relevant operating parameter(s).

Please further refer to FIG. **6B**, wherein the security light **500** comprises a wireless receiver **590**, a programmable controller circuitry or a microcontroller **540** loaded with at least one relevant program corresponding to a free setting algorithm of the user interface APP **601** loaded in the mobile device **600**, a light-emitting unit **550**, a photo sensor **520** and a motion sensor **530**, wherein when the security light **500** through the wireless receiver **590** receives a wireless instruction **609**, a relevant program according to the wireless instruction **609** is activated to perform on line free setting of operating parameter.

The free setting algorithm is a capacity scale simulation designed to enable a user to operate setting of capacity operating rate of an operating parameter of a lighting device or an electrical appliance, such as a ceiling fan with light kit or an air conditioner, on a touch screen of a mobile device. It is a method to simulate a maximum capacity of an operating function of a lighting device or an electrical appliance with a scale arrangement which allows a user to select a capacity operating rate of an operating parameter on a simulator. In the present invention two types of capacity scale simulator are disclosed to implement the free setting algorithm; the first capacity scale simulator is a distance length simulator such as a virtual track coupled with a free setting operator, wherein the capacity operating rate is determined by the parking location of the free setting operator on the virtual track, the second capacity scale simulator is a time length simulator such as a virtual button integrated with a capacity free running subroutine, wherein the capacity operating rate is determined by the time length a user continues to touch the virtual button compared with the time length of a half cycle period of the free running cycle period.

Please refer to FIG. **7** which is an exemplary embodiment of the present disclosure in accordance with the aforementioned APP based free setting technology. FIG. **7** illustrates an example of a visualized free setting algorithm of the user interface APP **601**. The free setting algorithm is implemented by visual elements comprising a group of icons on the display screen of a mobile device when a user interface APP of free setting is initiated. Basically, a security light may be designed to operate a variety illumination modes including manual override **701**, motion sensing related settings, such as motion delay time **703** and sensitivity **705**, lighting level adjustment **707** and color temperature setting **709**. The icons shown in FIG. **7** represent free setting algorithm comprising visual elements like free setting operator **71**, virtual track **75** and digital indicator **73**, to facilitate a user to set operating parameters of a security light. The display image of FIG. **7** is utilized for convenience to explain the free setting of the present disclosure, but not to limit the present invention. Aside from visualization implementation like FIG. **7**, the free setting algorithm may be implemented by acoustic means, for instance, instead of touch visual icons, a type of user interface APP not to be described here may be employed to pick up the user’s voice for performing free setting.

Please refer to the function block **701** of FIG. **7** and in view of FIG. **6A** and FIG. **6B**, the present invention discloses the manual override setting method with a manual

US 10,667,367 B2

23

override free setting algorithm. The manual override setting comprises a test mode, an auto mode, and a custom setting mode. When the test mode is operated, the microcontroller 540 operates to activate a subroutine to disable the photo sensor 520 such that the motion sensor 530 is operable during the day time and the user is able to check the functionality of the motion sensor 530 and make setting decisions for each of operating parameters. When the auto mode is operated, the APP operates to activate a subroutine of preset capacity operating rates for all operating parameters programmed in the APP to wirelessly transmit to the security light 500, the microcontroller 540 then operates to compute and adjust relevant control signals to cause the security light 500 to perform each operating parameter according to each preset capacity operating rate R. When the custom setting mode is operated, the APP operates to activate a subroutine to temporarily disable the motion sensor 530 for a programmable timer (sub block 701A) and the user is allowed to slide the free setting operator 71 along the virtual track 75 which serves as a time length counter, the full length of the virtual track 75 is equal to the maximum time length of the programmable timer which could be practically designed at 12 hours. Thus, when a user's finger 5 stops sliding and parks at a location point of $\frac{1}{3}$ of the full length of the virtual track 75 for instance, the indicator 73 of the capacity operating rate R simultaneously shows a time period of 4 hours just selected for performing a constant illumination mode counting from the dusk time when the photo sensor 520 automatically turns on the security light 500. Aside from the fixed time period timer (sub block 701A) for performing a general illumination, the custom setting mode further provides a clock time timer free setting option (sub block 701B), wherein the virtual track 75 serves as a clock time scale, wherein when the user's finger 5 is sliding along the virtual track 75, the indicator 73 of the capacity operating rate R synchronously shows the instantaneous clock time for setting reference and the clock time setting is completed and determined at the parking location when the user's finger 5 stops sliding, to operate custom setting clock time free settings the APP can be programmed to convert or transform a clock time setting into an equivalent of time period setting using the clock time reference from the mobile device 600 and wirelessly transmit such converted time period information to the security light 500 for on line execution. For instance, if the user sets 10 pm as the time point to convert the illumination mode from the timer mode to the motion sensing mode at time of 4 pm, the APP calculates to convert the 10 pm clock time to be an equivalent of $10 \text{ (pm)} - 4 \text{ (pm)} = 6 \text{ (hours)}$, the APP accordingly transmits an wireless instruction 609 to operate a time delay of 6 hours counting from the setting moment 4 pm, so configured the microcontroller 540 manages to perform time counting from the setting moment 4 pm for 6 hours to switch the security light 500 from the timer mode to the motion sensing mode regardless when the security light 500 is automatically turned on at a dusk time. The transformation work can also be done by the microcontroller 540 in the security light 500 instead of being done by the APP pre-loaded in the mobile device 600, in such case the APP simply provides clock time input to enable an algorithm in the microcontroller 540 to do the conversion job. Further, please refer to FIG. 7A through FIG. 7G in accompanying FIG. 7 wherein detailed descriptions of free setting parameters will be made. FIG. 7A and FIG. 7B respectively provide schematic illustrations of how free setting is operated with a user interface of the time period free setting algorithm (sub block 701A) and with a user interface of the

24

clock time free setting algorithm (sub block 701B). Shown in FIG. 7A is a time period timer set at 4 hours. Shown in FIG. 7B is a clock time timer set at 10:30 pm.

The present disclosure further discloses the motion delay time setting method with a motion delay time free setting algorithm. Please refer to a function block 703 of FIG. 7, when an intrusion motion is detected by the motion sensor 530, the microcontroller 540 manages to instantly turn on the security light 500 or to increase the illumination of the security light 500 from a low level illumination mode to a high level illumination mode to provide a security alert before operating to resume the turned off state or the low level illumination mode. In this embodiment, the virtual track 75 serves as the motion delay time scale with its full length representing the maximum time length of the motion delay time, wherein when a user's finger 5 slides the free setting operator 71 along the virtual track 75, an indicator 73 of the capacity operating rate R synchronously shows the instantaneous value of the motion delay time to help the user make a setting decision. If the maximum time length is designed at 20 minutes, a parking location at 5% of the full length of the virtual track 75 is indicated as 1 minute motion delay time by the indicator 73 of the capacity operating rate R, the microcontroller 540 accordingly manages to multiply the maximum motion delay time control signal $S(\text{max})$ by capacity operating rate R, $S(\text{new}) = S(\text{max}) \times R = 20 \text{ minutes} \times 5\% = 1 \text{ minute}$ and accordingly operates to perform a motion delay time of 1 minute. FIG. 7C corresponding to functional block 703 is a schematic illustration of how free setting is operated with a user interface of the motion delay time free setting algorithm. Shown in FIG. 7C is a motion delay time set at 1 minute or 5% of the maximum motion delay time.

The present disclosure further discloses the detection sensitivity setting method with a detection distance free setting algorithm. Please refer to a function block 705 of FIG. 7, which schematically illustrates the user interface for free setting the operating parameter of detection distance for the motion sensor 530. The full length of the virtual track 75 represents the maximum detection distance, wherein when a user's finger 5 slides the free setting operator 71 along the virtual track 75, an indicator 73 of the capacity operating rate is provided to synchronously show the instant changing value of the detection distance to help the user make a setting decision for a detection distance, if the maximum detection distance for the motion sensing circuitry is designed at 70 feet, when the user stops sliding and parks the free setting indicator 73 at a point equal to 30% of the full length of the virtual track 75, the indicator 73 of the capacity operating rate synchronously shows a detection distance of $70 \text{ feet} \times 30\% = 21 \text{ feet}$ is set for performing the detection distance of the motion sensor 530, the APP thereby transmits a wireless instruction 609 of the capacity operating rate valued at 30% to the security light 500, the microcontroller 540 upon receiving the wireless instruction 609 operates to activate a corresponding subroutine to proportionately adjust the voltage signal controlling the amplification of motion sensing signal and therefore the detection distance of the security light 500 is set for 21 ft. FIG. 7D corresponding to the functional block 705 provides a schematic illustration of how free setting is operated with a user interface of the sensitivity distance free setting algorithm. Shown in FIG. 7D is a detection distance set at 21 feet or $\frac{1}{3}$ of the maximum detection capacity.

The present disclosure further discloses the brightness setting method with an illumination level free setting algorithm. As shown in a function block 707 of FIG. 7 wherein the brightness free setting algorithm comprises a subroutine

US 10,667,367 B2

25

707A for setting high level illumination mode and another subroutine 707B for setting low level illumination mode. In the functional sub block 707A for setting the high level illumination mode, the length of the virtual track 75 represents the adjustable range of brightness level from a minimum starting point of 50% to a maximum ending point of 100% of designed maximum illumination capacity or from the minimum operating value of 1000 lumens to the maximum operating value of 2000 lumens. When a user slides the free setting operator 71 along the virtual track 75 of the capacity operating scale from the minimum starting point to the maximum ending point, the indicator 73 of the capacity operating rate synchronously changes its value from 50% to 100% or from 1000 lumens to 2000 lumens to help the user to make a parking decision based on the instantaneous percentage value or the actual operating value shown in the indicator 73 of the capacity operating rate. In the functional sub block 707B for setting the low level illumination mode, the length of virtual track 75 represents an adjustable range of brightness level from a minimum starting point of 0% to a maximum ending point of 50% of designed maximum capacity. When the user slides the free setting operator 71 along the virtual track 75 from the minimum starting point to the maximum ending point, the indicator 73 of capacitor operating rate synchronously changes the percentage value from 0% to 50% or from 0 lumens to 1000 lumens to help the user to make a parking decision based on the instantaneous operating percentage or actual operating value shown in the indicator 73 of the capacity operating rate. FIG. 7E and FIG. 7F respectively corresponding to sub block 707A and sub block 707B provide schematic illustrations of how free setting is operated with a user interface of the brightness free setting algorithm for the high level illumination mode and for the low level illumination mode. Shown in FIG. 7E is a brightness level set at 75% of the maximum illumination level or 1500 lumens lighting output for the high level illumination mode. Shown in FIG. 7F is a brightness level set at 20% of the maximum illumination capacity or 400 lumens lighting output for the low level illumination mode. FIG. 7G corresponding to the functional block 709 provides a schematic illustration of how free setting is operated with a user interface of the color temperature free setting algorithm. Shown in FIG. 7G is a color temperature set at 3000 K.

So configured with the user interface free setting algorithm, when the user is sliding the free setting operator 71 along the virtual track 75, the instantaneous capacity operating rate will be simultaneously shown in the indicator 73 of the capacity operating rate and thereby the user can instantly make a setting decision according to information provided by the indicator 73 of the capacity operating rate, the numerical information shown in the indicator 73 of the capacity operating rate can either be a percentage of the maximum capacity or an absolute number of operating parameter, for instances, if the operating parameter is for detection distance it is more meaningful to show the detection distance being 21 feet or 35 feet instead of 30% or 50%. Also good are operating parameters having to do with time length such as the motion sensor 530 activated light-on duration or a manual override mode wherein the motion sensor 530 is temporarily disabled for a longer time duration, for these types of operating parameters the user will appreciate more for knowing an absolute number rather than a percentage value. Regardless it can be designed with a program code to alternately change between an operating

26

percentage and an absolute number, the user can simply click or double click the free setting operator 71 to make such switch.

So configured with the interface free setting algorithm, the user is allowed to slide the free setting operator 71 between a minimum starting point and a maximum ending point on the virtual track 75 to decide a parking location for the free setting operator 71 and consequently a capacity operating rate is determined according to the indicator 73 of the capacity operating rate; when a confirmation/save button is pressed, the APP software accordingly manages to send out thru the mobile device 600 a wireless instruction signal 609 carrying a message of the capacity operating rate coded with a pertaining category of operating parameter, via a wireless transmission means (as Wi-Fi, Blue Tooth or RF) of the mobile device 600 to the security light fixture 500. For practical consideration, it could be designed to have the capacity operating rate starting from a minimum value instead of from zero point. For example, the motion delay time needs to have some minimum value such as 5 seconds. Otherwise, the motion sensor 530 would not perform at zero setting which may confuse the user. Same consideration on the detection distance setting that it has to start from some minimum value, such as two feet. Otherwise, the motion sensor 530 would never perform its function at zero setting. This just means that the starting length section from zero to the minimum value is blocked and hidden, it does not change the algorithm of calculating capacity operating rate by using the length P of a parking location measured from the starting zero point divided by the full length of the virtual track 75 "L", namely, $R=P/L$.

In addition, the contact between the user's finger 5 and the APP touch screen can not be a single point because the finger 5 has its minimum contacting area, it is practically meaningful to configure the length of the virtual track 75 in multiples of a minimum percentage increment. For example, if the minimum percentage increment is set at 5%, it means a total of 20 partition intervals are divided with the abscissa of each partition interval standing for a capacity operating rate of a multiple of 5%. Hence, the track length of the virtual track 75 is progressively built up from 0%, 5%, 10%, . . . , 95%, to 100%. Therefore, when the user's finger 5 slides along the virtual track 75, the capacity operating rate shown in the indicator 73 of capacity operating rate synchronously varies according to a sequence pattern of 0, 5%, . . . , 95%, and 100%. Therefore, when the user parks the free setting operator 71 at a point of the virtual track 75, said parking location falls in a partition interval with a corresponding capacity operating rate equal to some multiple of 5% increment.

The user interface 700 of the APP comprises at least one slidable free setting operator 71 coupled with at least one virtual track 75 and at least an indicator 73 of the capacity operating rate nearby the free setting operator 71 for instantaneous reference. The free setting operator 71 is slidable by the user's finger 5 along the virtual track 75, the virtual track 75 represents a simulation of the circuitry operating capacity of the security light 500 with respect to a category of operating parameter. For instance, if detection distance is referred as the operating parameter, the full length "L" of the virtual track 75 represents the maximum detection distance designed with the circuitry of the security light 500 for operating the detection distance, so configured, the detection distance can be adjusted by sliding the free setting operator 71 along the virtual track 75 from a starting point of minimum value to an ending point of maximum capacity. When the user stops sliding and parks the free setting

US 10,667,367 B2

27

operator **71**, for instance, at a middle point on the virtual track **75**. The capacity operating rate indicated is 50% or 35 feet if the maximum detection distance is 70 feet. The capacity operating rate is shown in the indicator **73** of the capacity operating rate designed on a screen location nearby the free setting operator **71** to provide the user with an instantaneous update the value of capacity operating rate while sliding motion is being conducted. The value shown on the indicator **73** of the capacity operating rate can be a relative percentage information or an absolute value information depending on the characteristic of the designated operating parameter(s). The objective of the present disclosure is to help the user to make easy free setting decisions based on the indicated information. The illustrations shown in FIG. 7C and FIG. 7D are an exemplary embodiment of the present disclosure to provide visual indications of absolute values respectively for motion delay time setting and detection distance setting, such that the user can certainly appreciate the time length information and detection distance information which can help them to make sliding and parking decision.

Corresponding to the free setting algorithm of the mobile device **600** part, the security light **500** part has a relevant software program which is the APP software loaded in the microcontroller **540** of the security light **500** for on line computing designated operating parameter(s) using the input of capacity operating rate R received from the user interface APP of the mobile device **600**. A plurality of sub-routines are designed to process corresponding operating parameters. Thus when a wireless instruction **609** generated by the user interface APP by the user is received through the wireless receiver **590**, the microcontroller **540** operates to activate a corresponding subroutine to interpret, compute and proportionately adjust the level of a relevant voltage control signal or time length control signal controlling the respective operating parameters of the security light **500** to perform the selected level(s) of the operating parameter(s). The capacity operating rate R is readable and interpretable to the microcontroller **540** for each category of operating parameters. Each subroutine pertaining to a category of operating parameter operates to multiply its maximum capacity value of control signal S(max) which can be a voltage control signal or a time length control signal by the capacity operating rate R to obtain a proportionately adjusted signal strength $S(\text{new}) = S(\text{max}) \times (R)$, the new control signal S(new) thereby operates to change the operating parameter accordingly. For example, if the free setting operator **71** is parked at 60% point on the virtual track **75** for the detection distance category of an operating parameter, the microcontroller **540** accordingly understands the user has set 42 feet (75 feet \times 60%) to be the detection distance and therefore responsively manage to proportionately adjust a voltage signal controlling the motion sensing circuitry. Please refer to FIG. 8A which schematically illustrates a flow chart for the mobile device part to perform the free setting algorithm of the present disclosure. In step **S801**, the user requires to open up the user interface APP with on line free setting method designed in a mobile device **600**, such as to start the operation of the free setting algorithm. Then, in step **S803**, the user selects a relevant free setting algorithm designed for setting a specific operating parameter, for instance, selecting one operating parameter of Manual mode, Motion Delay Time, Sensitivity and Brightness. In step **S805**, the user slides the free setting operator **71** along the virtual track **75** to adjust the operating variable of selected operating parameter. In step **S807**, the APP operates to compute and convert the user's instantaneous sliding

28

position into the capacity operating rate R, wherein the operating variable is the capacity operating rate R.

In step **S809**, the user observes the changing instantaneous value of the capacity operating rate R shown in the indicator **73** of the capacity operating rate R. In step **S811**, the user decides an acceptable capacity operating rate R by parking the free setting operator **71** at the decision moment. In step **S813**, the user confirms acceptance of the capacity operating rate R by pressing the saving button. Then in step **S815**, the APP operates to wirelessly transmit wireless instruction **609** with the selected capacity operating rate R to the security light **500**. Further refer to FIG. 8B which schematically illustrates the flow chart for the security light **500** part to perform the free setting algorithm of the present disclosure. In step **S821**, the wireless instruction **609** generated by the user interface APP pre-loaded in the mobile device **600** is received and converted by the wireless receiver **590** of the security light **500** into a message carrying signal(s). Then, in step **S823**, the microcontroller **540** of the security light **500** reads and interprets the message carrying signal to derive the percentage value of the capacity operating rate R. In step **S825**, the microcontroller **540** operates to activate a corresponding subroutine of the designated operating parameter. In step **S827**, the subroutine operates to perform computation of multiplying the stored maximum value of control signal S(max) by the received percentage value R of the capacity operating rate R to obtain a new control signal S(new), namely, $S(\text{new}) = S(\text{max}) \times R$. In step **S829**, the microcontroller **540** operates to apply such proportionately adjusted control signal S(new) to operate the relevant performing circuitry, the on line free setting of the operating parameter is thereby completed as step **S831**.

The user interface APP for free setting operates to transform the user's setting decision into capacity operating rate for wireless transmission to a remotely located security light **500**. There may be many methods to configure free setting algorithm of the mobile device. The first method disclosed is a virtual track method as shown in FIG. 7 wherein the user interface APP with free setting algorithm comprises a free setting operator **71**, a virtual track **75** coupled with the free setting operator and an indicator **73** of capacity operating rate, wherein the free setting operator **71** is slidable by the user's finger **5** along the virtual track **75** with the indicator **73** of capacity operating rate simultaneously showing an instantaneous value of the capacity operating rate while the sliding motion of the free setting operator is being conducted, wherein the value shown in the indicator **73** can be an operating percentage of the maximum operating capacity of the operating parameter or an actual operating level of the operating parameter, wherein the full length of the virtual track **75** represents a simulation of the maximum operating capacity of the relevant operating parameter characterized by a relevant circuitry, wherein the virtual track **75** is divided into a number of small compartments representing different values of capacity operating rates being lined up according to value sequence to form the full length of the virtual track, wherein capacity operating rate is determined by the parking location of the free setting operator falling in a compartment of the virtual track with a corresponding capacity operating rate when the sliding motion stops, wherein when a parking decision is made, the user may touch or press the "Save" button on the upper right corner of the APP screen and the APP accordingly manages to transmit via the mobile device a wireless instruction signal carrying a message of the selected capacity operating rate to the security light.

Aside from the above described virtual track method as a first capacity scale simulator, the present invention also

US 10,667,367 B2

29

discloses a second capacity scale simulator using a virtual button method. Please refer to FIG. 9 which is a preferred exemplary embodiment of the present disclosure. FIG. 9 is an image of the user interface APP 770 using virtual button method that may be displayed on the screen of a mobile device. The user interface APP 770 may comprise a plurality of free setting algorithms loaded in the mobile device 600 for setting various operating parameters including at least settings of manual override mode 771, setting of motion delay time mode 773, setting of sensitivity 775, setting of high level brightness 777A and setting of low level brightness 777B. Each free setting algorithm for a relevant operating parameter comprises a free setting operator 72, a free running subroutine (not shown) and an indicator 74 of the instantaneous capacity operating rate, wherein the free setting operator 72 is a virtual button designed on the touch screen panel of the mobile device 600. When the virtual button is continuously touched by a finger 5 of the user, the user interface APP operates to activate a free running subroutine to gradually increase the capacity operating rate from a minimum level to a maximum level and then from the maximum level to the minimum level to complete a full cycle of free running motion with a pace which allows the user to observe, determine and take action. During a free running cycle period, the instantaneous value of the changing capacity operating rate is simultaneously shown in the indicator 74 of the capacity operating rate, wherein the value of capacity operating rate can be an operating percentage or an absolute operating value of the operating parameter, wherein the moment at which the user's finger 5 is removed from the virtual button 72, the free running motion is instantly ceased with the capacity operating rate thereby being locked in at the instant level of the last moment of the free running motion. The time length of a half cycle period of the free running motion represents a simulation of the value of the maximum operating capacity of a relevant operating parameter characterized by a relevant circuitry, wherein the time length of each half cycle is divided into a number of time compartments representing different values of capacity operating rates being lined up according to value sequence, wherein the capacity operating rate is determined by the time point when the user's finger is removed from the virtual button, wherein the time point corresponds to a time compartment configured with a capacity operating rate. When a setting decision is made, the user interface APP manages to transmit via the mobile device wireless instruction signals to the security light to set the operating parameter.

Please refer to FIG. 9A and FIG. 9B in view of FIG. 9, which schematically illustrate images of the user interface APP 770 respectively to highlight motion delay time setting 773 and high level brightness setting 777. When the virtual button 72 is continuously touched by a finger 5 of the user, the user interface APP operates to activate a free running subroutine to change cyclically the capacity operating rate from a maximum value to a minimum value, and vice versa, with a pace which allows the user to observe, determine and take action. During a free running cycle period, the instantaneous value of the changing capacity operating rate is simultaneously shown in the indicator 74 of the capacity operating rate, for instance, "5 s" of motion delay time in FIG. 9A and "75%" of high level brightness in FIG. 9B. If the user releases his finger from the virtual button 72 at a time point to select a value, the indicator 74 locks at a value of capacity operating rate that is what the user wishes. When a setting is done, the user may touch or press the "Save" button to transmit via the mobile device wireless instruction

30

signals to the security light to set the relevant operating parameter. Basically, based on the advantage of the free running subroutine, the virtual button method represented by FIG. 9 uses less icons in implementing the free setting algorithm than the virtual track method represented by FIG. 7.

FIG. 10A and FIG. 10B as shown are operating flow charts of the on line free setting APP similar to FIG. 8A and FIG. 8B, the only difference between FIG. 8A and FIG. 10A is the implementation method for free setting the capacity operating rate. FIG. 8A illustrates the virtual track method by sliding a free setting operator 71 along a virtual track 75 of a capacity operating scale and with the help of indicator 73 providing the instantaneous value of capacity operating rate while sliding motion is being conducted, the user is able to instantly choose a parking point to determine a desired capacity operating rate. FIG. 10A illustrates the virtual button method by continuously touching a virtual button 72 of a free setting operator to activate a free running subroutine and with the help of indicator 74 providing instantaneous value of changing capacity operating rate the user is able to instantly choose a time point to de-touch the virtual button 72 to lock in a free running capacity operating rate. In other words, the free setting method of FIG. 8A uses a distance length simulation approach to derive the capacity operating rate while the free setting method of FIG. 10A uses a time length simulation approach to derive the capacity operating rate. The instantaneous value of capacity operating rate can either be an operating percentage or an actual operating value; it can be designed such that a simple touch or double touches within a short time interval on the free setting operator can alternatively switch between showing an operating percentage and showing an absolute value of the capacity operating rate. So configured in step 901 the user is required to open On Line Free Setting APP on the touch screen panel of a mobile phone. In Step 903 the user selects a relevant free setting algorithm for an operating parameter. In Step 907 the user touches or presses the free setting operator to activate a free running subroutine. In Step 909, the free running subroutine enables the indicator of capacity operating rate synchronously showing instantaneous value of gradually changing capacity operating rate from a minimum level to a maximum level and then from the maximum level to the minimum level to complete an operating cycle. In Step 911, the user observes the changing free running value of the capacity operating rate. In Step 913, the user decides to select an instantaneous value of the free running capacity operating rate. In Step 915 the user removes his finger from the free setting operator to lock in the instantaneous value of capacity operating rate. In Step 917 the user confirms acceptance of the locked in value of capacity operating rate by pressing the Save button. In Step 919, the APP operates to transmit a wireless instruction with a message of selected operating rate coded with the relevant operating parameter to the security light 500. FIG. 10A as a user interface APP is the first part of the on line free setting APP loaded in a mobile phone operable on the touch screen panel of the mobile phone. FIG. 10B is the second part of the on line free setting APP loaded in the microcontroller of the security light 500 to interpret, compute and set operating parameter(s) according to the wireless instruction(s) received from the mobile phone.

As shown in FIG. 10B, the second part of on line free setting APP starts with Step 921 wherein the receiver of the security light receives and convert wireless instruction signal into message carrying signal(s). In Step 923 the microcontroller reads and interprets the message carrying signal(s)

US 10,667,367 B2

31

to obtain value(s) of capacity operating rate(s). In Step 925 the microcontroller accordingly activates a corresponding subroutine for processing the operating rate. In Step 927, the APP operates to multiply its maximum control signal S(max) by the capacity operating rate R to obtain a proportionately adjusted control signal S(new). In Step 929, the microcontroller manages to apply the proportionately adjusted control signal S(new) to the relevant circuitry. In Step 931 the on line setting of a relevant operating parameter is completed.

In summary, the present disclosure of APP based on line free setting method for determining operating parameters of a security light 500 offers users excellent values of convenience, functionality as well as cost savings when compared with the traditional remote control technology in view of the following feature comparisons.

The present disclosure employs a compute and play technology for free setting operating parameters while the traditional remote control uses pick and play method for modifying operating parameter. The pick and play method requires an external memory to store all predetermined values of operating parameters for pick and play by a controller according to the wireless instruction 609. It can only offer a limited selection constrained by the memory capacity and adds cost of installing such memory unit. The present disclosure on the other hand is capable of offering an on line free setting of operating parameter through a computing algorithm. No external memory is used to pre-store a limited database for pick and play performance.

The free setting algorithm is an APP software designed for improving the inconvenience of traditional hardware based remote control technology. Prior art such as U.S. Pat. No. 7,880,394 (the 394 prior art) is a rather old technology compared with the present invention; the 394 prior art was an obvious combination of two existing technologies available at time of patent filing. The two existing technologies including pick and play method and remote control method had been used for a long time in TV program selection, air conditioner control, ceiling fan and light kit control . . . etc. before the filing day of the 394 prior art. The user interface disclosed in the 394 prior art is a relatively old technology, wherein the remote controller comprises a multiple of hardware based push buttons for alternatively setting up to three levels (high, medium and low) of various operating parameters. It simply serves as a medium for transmitting a user's selection decision to the control circuitry of the security light to perform pick and play function to alternatively modify operating parameters. The user interface of the present invention on the other hand offers more features which are superior to the 394 prior art;

The user interface of the present invention can be free loaded in a mobile phone. This represents a great convenience and cost saving. No extra money is required to spend for furnishing a separate remote controller. The mobile phone has a massive capacity in terms of storage memory and computing power. The external memory used in the 394 prior art is negligible when compared with the massive memory capacity of giga bytes installed in a smart mobile phone which is designed for taking thousands of photographs. A slight allocation of memory capacity of a mobile phone would be more than multiples of the said external memory used in the 394 prior art and there is no extra cost for making use of the mobile phone capacity for controlling the lighting characteristics of the security lights. Additionally, the smart phone is in fact a computer with massive computing and processing power which can be further used

32

to make a connected lighting device become highly intelligent with the help of artificial intelligence and machine learning technologies.

The algorithm of the user interface is designed with user friendly features; unlike the 394 prior art which can only operates high/medium/low options by consecutively pressing a button for a relevant operating parameter, the present invention actually can offer a lot more options of operating parameters with the memory capacity of mobile phone. Furthermore, the indicator is able to provide instantaneous status of changing capacity rate while free setting is in process therefore the user is well aware of what he can choose and thereby making a desired setting decision.

There is no extra operating cost as it becomes an application of the mobile phone. Hassles such as unable to locate the whereabouts of remote controllers and battery run out because of non-frequent use would no longer be a concern as the mobile phone is always in your purse or pocket for any time use and the battery is frequently charged.

The user interface APP pre-loaded in the mobile device enables the lighting fixture to have an access to the use of the massive capacity of storage memory and computing power of the mobile phone. Comparatively the 394 prior art teaching the method of installing an external memory in the lighting fixture for performing pick and play becomes an outdated technique. For using the massive capacity of storage memory and computing power of a smart phone, the job of computing various operating parameters can be done in either the APP of the mobile phone or the program codes written in the microcontroller of the lighting fixture. For computing job done in the mobile phone the operating variables generated are operating parameters while for computing job done in the microcontroller of the lighting fixture the operating variables generated are capacity operating rates. In either case no external memory is required.

The capacity scale simulation disclosed in the present invention is a user friendly technology enabling the user to free set a desired level of operating parameters with the help of capacity operating rate indicator. The 394 prior art simply does not have any user friendly skills comparable to the present disclosure.

In the present disclosure more useful operating functions are designed to fully capitalize the benefit of on line setting method; a good example is the manual override mode, instead of switching to a straight dusk to dawn lighting mode. The present disclosure instead offers an adjustable timer mode, wherein the user is able to set any time duration for operating a general illumination mode with motion sensor 530 being disabled, the user simply slides the free setting operator 71 along the capacity simulation scale of the virtual track 75 to decide the time length wanted for night activity. Additionally, such general illumination mode can be set with clock time point instead of time length, such arrangement is only possible with the mobile device 600 to provide clock time input. Another good example is the illumination level adjustment for various illumination modes activated by either the photo sensor 520 or the motion sensor 530 as different users may have different preferences according to their life styles. The on line free setting method of the present disclosure enables the user's to select any level of lighting brightness by sliding the free setting operator 71 respectively along the capacity simulation scale of the virtual track 75 for the high level illumination mode from 50% to 100% of full brightness and low level illumination mode from 0% to 50%, when the low level is set at 0% the

US 10,667,367 B2

33

security light **500** is a single level security light, otherwise it is a two level security light or a multilevel/life style security light.

Please refer to FIG. **11** of a preferable exemplary embodiment of the present disclosure. The APP based technology can be further extended to include additional functionality wherein the security light **500** may be integrated with other electric appliances, for instance, with an electric ceiling fan. Probably, a combinatorial system of a security light **500** with a ceiling fan is accomplished by modifying the controller circuitry of the loading and power control unit **540**. FIG. **11** illustrates a visualized implementation example of free setting algorithms of a user interface APP for a combinatorial system consisting of security light and ceiling fan wherein visual selection elements representing Fan, Light and Custom setting are designed under the category of Manual Override **991** to offer a user the advantage to select appropriate elements and to on line set operating parameters of both the security light **500** and the ceiling fan. Accordingly, for example, the ceiling fan is controlled to rotate in forward or reverse direction with fan speed adjustable by operating the user interface APP. In simple term, the operating parameter of the present disclosure is used for controlling at least one of various lighting and electrical characteristics of the ceiling fan with light kit including timer settings, fan speed settings and fan rotation direction settings, light intensity settings and light color temperature settings.

The above-mentioned descriptions for various embodiments of free setting algorithm represent merely the exemplary embodiments of the present disclosure without any intention to limit the scope of the present disclosure thereto. Various equivalent changes, alterations or modifications based on the claims of present disclosure are all consequently viewed as being embraced by the scope of the present disclosure.

What is claimed is:

1. An on line free setting method for setting at least one operating parameter of a lighting device, comprising:
 - using a user interface APP comprising at least one free setting algorithm preloaded in a mobile device to transform a user's setting decision into at least one operating variable of at least one operating parameter of the lighting device;
 - transmitting via the mobile device at least one wireless instruction signal carrying at least one message of the at least one operating variable to the lighting device for processing at least one value of the at least one operating parameter of the lighting device according to the user's setting decision; and
 - using a controller of the lighting device, designed with a capacity to interpret the at least one wireless instruction signal received by a wireless signal receiver of the lighting device and accordingly manages to output at least one control signal to control, select or set the at least one value of the at least one operating parameter of the lighting device;
 wherein when the user interface APP is activated and concluded with at least one setting decision, the user interface APP manages to transmit via the mobile device the at least one wireless instruction signal carrying at least one message of the at least one operating variable to the lighting device, wherein the at least one operating variable is used for processing at least one value of the at least one operating parameter of the lighting device;

34

wherein the at least one value of the at least one operating parameter is stored in a memory of the controller for a repetitive performance, wherein the at least one value of the at least one operating parameter stored is replaceable by processing a new at least one operating variable selected by the user;

wherein the at least one operating parameter is used for controlling at least one of various functional performance settings of the lighting device including at least timer setting, light intensity setting, color temperature setting, detection sensitivity setting or performance mode switching and setting between two different illumination performance modes;

wherein the user interface APP is operable on a touch screen panel of the mobile device, wherein the free setting algorithm is a capacity scale simulation process implemented by a visual configuration of a free setting operator incorporated with a capacity scale simulator and an indicator of a capacity operating rate to facilitate the user's decision making process in setting a desired level of the at least one operating parameter, wherein when the free setting operator is activated by the user to interact with the capacity scale simulator, the user's interface APP responsively manages to determine a value of the capacity operating rate by selection or computation according to an instantaneous state of interaction between the free setting operator and the capacity scale simulator with the indicator of the capacity operating rate simultaneously showing the instantaneous value of the capacity operating rate, wherein the capacity operating rate shown in the indicator can be an operating percentage, an operating chart or an actual operating value of a relevant operating parameter, wherein when a free setting motion of the free setting operator is ceased, the user interface APP manages to generate the at least one operating variable corresponding to the capacity operating rate being determined and accordingly operates to transmit the at least one wireless instruction signal carrying the at least one message of the at least one operating variable to the lighting device for execution.

2. The on line free setting method for setting at least one operating parameter of a lighting device according to claim 1, wherein the capacity scale simulator is a virtual track, wherein the free setting algorithm is implemented by operating the free setting operator to interact with the virtual track and the indicator of the capacity operating rate, wherein the virtual track is designed on the touch screen panel of the mobile device, wherein the free setting operator is slidable by the user's finger along the virtual track with the indicator of the capacity operating rate simultaneously showing an instantaneous value of the changing capacity operating rate while the sliding motion of the free setting operator is being conducted, wherein the value shown in the indicator of the capacity operating rate can be an operating percentage, an operating chart or an actual operating value of the at least one operating parameter, wherein the full length of the virtual track represents a simulation of a value of a maximum operating capacity of the at least one operating parameter, wherein the capacity operating rate is incrementally changed according to a length of the sliding motion and is determined by a final parking location of the free setting operator on the virtual track when the sliding motion stops.

3. The on line free setting method for setting at least one operating parameter of a lighting device according to claim 2, wherein the at least one operating variable is the capacity

US 10,667,367 B2

35

operating rate of the at least one operating parameter selected by the user, wherein the virtual track is divided into N sensing compartments aligned from one end of the virtual track thru the other end of the virtual track, wherein each sensing compartment of the N sensing compartments is configured with a touch-sensing capacity designed to execute a different capacity operating rate valued incrementally along a sliding direction of the virtual track whenever the sensing compartment is touched during the sliding motion, wherein when the slide motion is ceased and the free setting operator is parked on a sensing compartment on the virtual track, a voltage signal of the at least one operating variable is generated by the user's interface APP representing the user's selection of the capacity operating rate of the at least one operating parameter and simultaneously a selected capacity operating rate is shown in the indicator, the at least one operating variable generated is then transmitted by the mobile device to the lighting device for execution, wherein N is an integer equal to or greater than 2.

4. The on line free setting method for setting at least one operating parameter of a lighting device according to claim 3, wherein the controller of the lighting device is designed to operate a pick and play process for processing the at least one operating variable received thru the wireless signal receiver, wherein for each operating parameter a data base comprising N sets of pre-calculated values of the operating parameter respectively corresponding to N different operating variables are stored in a memory unit accessible to the controller, wherein the controller operates to pick a corresponding value of the at least one operating parameter in the data base according to a value of the at least one operating variable to output at least one control signal to control a switching circuitry to accordingly adjust a functional performance of a lighting characteristic of the lighting device related to the at least one operating parameter.

5. The on line free setting method for setting at least one operating parameter of a lighting device according to claim 2, wherein the at least one operating variable of the at least one operating parameter is the capacity operating rate wirelessly transmitted to the lighting device for computing and setting a relevant operating parameter, wherein the capacity operating rate is determined by measuring a ratio of the length of the parking location on the virtual track from a starting point of the virtual track against the full length of the virtual track, wherein the ratio is further rounded off to the closest integer to become the at least one operating variable for setting the operating parameter selected by the user, wherein the controller of the lighting device is designed with a computing algorithm to convert a value of the at least one operating variable received from the wireless signal receiver to a corresponding value of an operating parameter, wherein the controller outputs at least one control signal to control a switching circuitry to accordingly adjust a functional performance of a lighting characteristic of the lighting device related to the operating parameter according to the value of the operating parameter being produced by the computing algorithm.

6. The on line free setting method for setting at least one operating parameter of a lighting device according to claim 1, wherein the capacity scale simulator is a capacity free running process and the free setting operator is a virtual button, wherein the free setting algorithm is implemented by operating the virtual button to interact with the capacity free running process and the indicator of the capacity operating rate, wherein the virtual button is designed on the touch screen panel of the mobile device, wherein when the virtual button is continuously touched, the user interface APP

36

operates to activate the capacity free running process to gradually increase the capacity operating rate from a minimum level to a maximum level and then from the maximum level to the minimum level to complete a full cycle of a free running motion, wherein during a free running cycle period an instantaneous value of a stepwise changing capacity operating rate is simultaneously shown in the indicator of the capacity operating rate, wherein the value shown in the indicator of capacity operating rate can be the operating percentage, an operating chart or an actual operating value of the at least one operating parameter, wherein at a moment at which the user's finger is removed from the virtual button, the capacity free running motion is instantly ceased with the capacity operating rate thereby being locked in at an instantaneous level of the last step of the free running motion, wherein the time length of a half cycle period of the free running motion represents a simulation of a value of a maximum operating capacity of the at least one operating parameter, wherein the capacity operating rate is determined by the time length the user's finger staying in touch screen panel with the virtual button during each half cycle period of the free running motion.

7. The on line free setting method for setting at least one operating parameter of a lighting device according to claim 6, wherein the at least one operating variable of the at least one operating parameter is the capacity operating rate wirelessly transmitted to the lighting device for controlling and setting a relevant operating parameter, wherein the capacity operating rate is determined by measuring a ratio of the time length of the virtual button being continuously touched by the user's finger in each half cycle period against the time length of the half cycle period of the free running motion, wherein the ratio is further rounded off to the closest integer to become the at least one operating variable for setting the at least one operating parameter selected by the user.

8. The on line free setting method for setting at least one operating parameter of a lighting device according to claim 6, wherein each half cycle period of the free running motion is divided into N sections of time domains with each of the N sections of time domains being assigned a value of the capacity operating rate in an increasing pattern during a first half cycle period of a free running cycle period and in a decreasing pattern during a second half cycle period of the free running cycle period, wherein at a moment when the free running motion arrives at a time domain assigned with a corresponding value of the capacity operating rate and the user's finger is removed from the virtual button, the free running motion is instantly ceased and the capacity operating rate is thereby locked in at the value pertaining to the time domain, the user's interface APP accordingly operates to wirelessly transmit the value of the capacity operating rate thru the mobile device to the lighting device for execution, wherein N is an integer equal to or greater than 2.

9. The on line free setting method for setting at least one operating parameter of a lighting device according to claim 8, wherein the controller of the lighting device is designed to operate a pick and play process for processing the at least one operating variable received thru the wireless signal receiver, wherein for each the at least one operating parameter a data base comprising N sets of pre-calculated values of the at least one operating parameter respectively corresponding to N different operating variables are stored in a memory unit accessible to the controller, wherein the controller operates to pick a corresponding value of the at least one operating parameter in the data base according to a value of the at least one operating variable to output at least one control signal to control a switching circuitry to accordingly

US 10,667,367 B2

37

adjust a functional performance of a lighting characteristic of the lighting device related to the at least one operating parameter.

10. The on line free setting method for setting at least one operating parameter of a lighting device according to claim 1, wherein the mobile device is a mobile phone, a pad, a PDA, a notebook, a smart watch, a smart speaker or a remote controller featured with a capacity to download an APP from an Internet or a cloud server for controlling and setting the at least one operating parameter of the lighting device.

11. The on line free setting method for setting at least one operating parameter of a lighting device according to claim 10, wherein the free setting algorithm of the user interface APP is a voice recognition software preloaded in the smart speaker from the internet or the cloud server to transform a voice instruction of the user's setting decision into the at least one operating variable of the at least one operating parameter of the lighting device and convert the at least one operating variable into the at least one wireless instruction signal for transmitting to the wireless external control signal receiver of the lighting device.

12. An LED security light, comprising:

a light emitting unit comprising at least a first LED lighting load emitting light with a first color temperature;

a loading and power control unit;

a photo sensor;

a motion sensor;

a power supply unit; and

an external control unit, electrically coupled with the loading and power control unit;

wherein the loading and power control unit comprises a controller and a switching circuitry, wherein the controller is electrically coupled with the photo sensor, the motion sensor and the switching circuitry;

wherein the switching circuitry is electrically coupled between a power source of the power supply unit and the light emitting unit;

wherein the power source is a DC power source;

wherein the switching circuitry comprises at least a first unidirectional semiconductor switching device;

wherein the controller outputs control signals to control the switching circuitry for delivering different electric powers to the light emitting unit such that the light emitting unit respectively generates illuminations of different light intensities for performing different illumination modes activated by the photo sensor, the motion sensor and/or the external control unit;

wherein at dusk when an ambient light detected by the photo sensor is lower than a first predetermined value, the loading and power control unit operates to turn on the light emitting unit to perform a low level illumination mode emitting a light with a low light intensity;

wherein when a motion signal is detected by the motion sensor, the loading and power control unit operates to increase the electric power delivered to the light emitting unit to perform a high level illumination mode emitting the light with a high light intensity for a preset time period before being switched back to the low level illumination mode;

wherein at dawn when the ambient light detected by the photo sensor is higher than a second predetermined value, the light emitting unit is switched off by the loading and power control unit;

wherein the external control unit is a wireless external control signal receiver electrically coupled with the controller to receive, decode and convert at least one

38

wireless instruction signal into at least one value of at least one operating variable interpretable to the controller, wherein the controller is programmed with an APP for the LED security light for processing the at least one value of the at least one operating variable for setting the at least one operating parameter according to the at least one operating variable received from the wireless external control signal receiver, wherein the at least one operating variable represents a setting decision by a user for choosing at least one capacity operating rate for operating at least one functional performance of the at least one operating parameter of the LED security light set by the user thru a mobile device, wherein the at least one operating parameter is used for controlling at least one of functional performance settings of the LED security light including timer setting, light intensity setting, color temperature setting, detection sensitivity setting or performance mode switching and setting between two different illumination performance modes featured with different light intensities and different light color temperatures.

13. The LED security light according to claim 12, wherein the LED security light is designed with an on line free setting method for setting at least one operating parameter of the LED security light, comprising:

a user interface APP comprising at least one free setting algorithm preloaded in the mobile device to transform at least one user's setting decision into at least one operating variable;

wherein when the user interface APP is activated and concluded with the at least one user's setting decision, the user interface APP manages to transmit via the mobile device at least one wireless instruction signal carrying at least one message of the at least one operating variable to the LED security light, wherein the at least one operating variable is used for processing or setting the at least one operating parameter of the LED security light.

14. The LED security light according to claim 13, wherein the user interface APP is operable on a touch screen panel of the mobile device, wherein the free setting algorithm is a capacity scale simulation process implemented by a visual configuration of a free setting operator incorporated with a capacitor scale simulator and an indicator of the capacity operating rate to facilitate making the at least one user's setting decision in setting at least one desired level of the at least one operating parameter, wherein when the free setting operator is activated by the user to interact with the capacity scale simulator, the user interface APP responsively manages to gradually adjust a value of the capacity operating rate according to an instantaneous state of interaction between the free setting operator and the capacity scale simulator with the indicator of the capacity operating rate simultaneously showing the instantaneous state of the capacity operating rate, wherein the capacity operating rate shown in the indicator can be an operating percentage, an operating chart or an actual operating value of a relevant operating parameter, wherein when a free setting motion of the free setting operator is ceased with at least one setting decision, the user interface APP manages to generate the at least one operating variable corresponding to a selection of the at least one capacity operating rate and accordingly operates to transmit the at least one wireless instruction signal carrying a message of the operating variable to the LED security light for setting the relevant operating parameter.

15. The LED security light according to claim 14, wherein the capacity scale simulator is a virtual track, wherein the

US 10,667,367 B2

39

free setting algorithm is implemented by operating the free setting operator to interact with the virtual track and the indicator of the capacity operating rate, wherein the free setting operator is slidable by the user's finger along the virtual track with the indicator of the capacity operating rate simultaneously showing instantaneous state of a changing capacity operating rate while the sliding motion of the free setting operator is being conducted, wherein the state shown in the indicator of the capacity operating rate can be an operating percentage, an operating chart or an actual operating value of the at least one operating parameter, wherein the full length of the virtual track represents a simulation of the value of the maximum operating capacity of the at least one operating parameter, wherein the capacity operating rate is determined by a parking location of the free setting operator on the virtual track when the sliding motion stops.

16. The LED security light according to claim 14, wherein the capacity scale simulator is a capacity free running process and the free setting operator is a virtual button, wherein the free setting algorithm is implemented by the virtual button, the capacity free running process interacting with the virtual button and the indicator of the capacity operating rate, wherein the virtual button is designed on the touch screen panel of the mobile device, wherein when the virtual button is continuously touched by a user's finger, the user interface APP operates to activate the capacity free running process to gradually increase the capacity operating rate from a minimum level to a maximum level and then from the maximum level to the minimum level to complete a full cycle of free running motion, wherein during a free running cycle period the instantaneous state of a stepwise changing capacity operating rate is simultaneously shown in the indicator of the capacity operating rate, wherein the state of the capacity operating rate can be an operating percentage, an operating chart or an actual operating value of the at least one operating parameter, wherein at a moment when the user's finger is removed from the virtual button, the free running motion is instantly ceased with the capacity operating rate thereby being locked in at an instantaneous level of the last step of the free running motion, wherein the time length of a half cycle period of the free running motion represents a simulation of the value of the maximum operating capacity of the at least one operating parameter wherein the capacity operating rate is determined by the time length the user's finger staying in touch screen panel with the virtual button compared with the time length of a half cycle period of the free running motion.

17. The LED security light according to claim 14, wherein the mobile device is a mobile phone, a pad, a PDA, a notebook, a smart watch, a smart speaker or a remote controller, featured with a capacity to download the user interface APP from an Internet or a cloud server for controlling and setting the at least one operating parameter of the LED security light.

18. The LED security light according to claim 17, wherein the free setting algorithm of the user interface APP is a voice recognition software preloaded in the smart speaker from the internet or the cloud server to transform a voice instruction of the user's setting decision into at least one operating variable of the at least one operating parameter of the LED security light and convert the at least one operating variable into the at least one wireless instruction signal for transmitting to the wireless external control signal receiver of the LED security light.

19. The LED security light according to claim 12, wherein the wireless receiver is a Wi-Fi wireless external control

40

signal receiver, a Blue Tooth wireless receiver, a Zig Bee wireless receiver or a RF wireless receiver.

20. The LED security light according to claim 12, wherein the at least one operating parameter is for setting a timer for performing a manual override illumination mode, wherein the security light is controlled by the photo sensor and the timer for performing a general illumination mode with the motion sensor being temporarily disabled.

21. The LED security light according to claim 20, wherein the timer is a time length setting timer or a clock time setting timer.

22. The LED security light according to claim 12, wherein the at least one operating parameter is for setting the preset time period for performing the high level illumination mode.

23. The LED security light according to claim 12, wherein the at least one operating parameter is for setting the detection distance of the motion sensor.

24. The LED security light according to claim 12, wherein the at least one operating parameter is for setting the light intensity of the low level illumination mode or the high level illumination mode.

25. The LED security light according to claim 12, wherein the at least one operating parameter is for setting a color temperature of the low level illumination mode or the color temperature of the high level illumination mode; wherein the light emitting unit is composed of the first LED lighting load emitting light with the first color temperature and a second LED lighting load emitting light with a second color temperature, wherein the second color temperature is higher than the first color temperature, wherein the first LED lighting load and the second LED lighting load are electrically connected in parallel covered by a light diffuser to create an effect of a mingled light color temperature; wherein the switching circuitry comprises the first unidirectional semiconductor switching device and a second unidirectional semiconductor switching device respectively connected to the first LED lighting load and the second LED lighting load, wherein the controller in response to an instructional signal of the at least one operating variable received from the wireless external control signal receiver operates to activate a color temperature tuning process to respectively control different conduction rates between the first semiconductor switching device and the second semiconductor switching device to manage electric powers respectively allocated to the first LED lighting load and the second LED lighting load for tuning the mingled light color temperature, wherein for performing a power allocation between the first LED lighting load and the second LED lighting load the conduction rate of the first unidirectional semiconductor switching device and the conduction rate of the second unidirectional semiconductor switching device are reversely and complementarily adjusted such that a total electric power delivered to the light emitting unit remains essentially unchanged.

26. An LED security light, comprising:

a light emitting unit comprising at least a first LED lighting load emitting light with a first color temperature;

a loading and power control unit;

a photo sensor;

a motion sensor;

a power supply unit; and

an external control unit, electrically coupled with the loading and power control unit;

wherein the loading and power control unit comprises a controller and a switching circuitry, wherein the con-

US 10,667,367 B2

41

troller is electrically coupled with the photo sensor, the motion sensor and the switching circuitry;
 wherein the switching circuitry is electrically coupled between a power source of the power supply unit and the light emitting unit, wherein the power source is a DC power source;
 wherein the switching circuitry comprises at least a first unidirectional semiconductor switching device;
 wherein the controller outputs control signals to control the switching circuitry for delivering different electric powers to the light emitting unit such that the light emitting unit respectively generates illuminations of different light intensities for performing different illumination modes activated by the photo sensor, the motion sensor and/or the external control unit;
 wherein at dusk when an ambient light detected by the photo sensor is lower than a first predetermined value, the loading and power control unit operates to activate the motion sensor with the light emitting unit in a turned off state;
 wherein when a motion signal is detected by the motion sensor, the loading and power control unit operates to deliver an electric power to the light emitting unit to perform a high level illumination mode emitting the light with a high light intensity for a preset time period before being switched back to the turned off state;
 wherein at dawn when the ambient light detected by the photo sensor is higher than a second predetermined value, the light emitting unit is switched off by the loading and power control unit;
 wherein the external control unit is a wireless external control signal receiver electrically coupled with the controller to receive, decode and convert at least one wireless instruction signal into at least one value of at least one operating variable interpretable to the controller, wherein the controller is programmed with an APP for the LED security light for processing the at least one value of the at least one operating variable for setting at least one operating parameter, wherein the at least one operating variable represents a setting decision by a user for choosing at least one capacity operating rate for operating at least one functional performance of the at least one operating parameter of the LED security light set by the user through a mobile device, wherein the at least one operating parameter is used for controlling at least one of functional performance settings of the LED security light including timer setting, light intensity setting, color temperature setting, detection sensitivity setting or performance mode switching and setting between two different illumination performance modes featured with different light intensities and light color temperatures.

27. The LED security light according to claim 26, further comprising:

a user interface APP comprising at least one free setting algorithm preloaded in the mobile device to transform at least one user's setting decision into the at least one operating variable;

wherein when the user interface APP is activated and concluded with the at least one user's setting decision, the user interface APP manages to transmit via the mobile device at least one wireless instruction signal carrying the least one message of the at least one operating variable to the LED security light, wherein the at least one operating variable is used for processing or setting the at least one operating parameter of the LED security light.

42

28. The LED security light according to claim 27, wherein the user interface APP is operable on a touch screen panel of the mobile device, wherein the free setting algorithm is a capacity scale simulation process implemented by a visual configuration of a free setting operator incorporated with a capacitor scale simulator and an indicator of the capacity operating rate to facilitate making the at least one user's setting decision in setting at least one desired level of the at least one operating parameter, wherein when the free setting operator is activated by the user to interact with the capacity scale simulator, the user interface APP responsively manages to gradually adjust a value of the capacity operating rate according to an instantaneous state of interaction between the free setting operator and the capacity scale simulator with the indicator of the capacity operating rate simultaneously showing the instantaneous state of the capacity operating rate, wherein the capacity operating rate shown in the indicator can be an operating percentage, an operating chart or an actual operating value of a relevant operating parameter, wherein when a free setting motion of the free setting operator is ceased with at least one setting decision, the user interface APP manages to generate the at least one operating variable corresponding to a selection of the at least one capacity operating rate and accordingly operates to transmit at least one wireless instruction signal carrying at least one message of the at least one operating variable to the LED security light for setting the relevant operating parameter.

29. The LED security light according to claim 28, wherein the capacity scale simulator is a virtual track, wherein the free setting algorithm is implemented by operating the free setting operator to interact with the virtual track and the indicator of the capacity operating rate, wherein the free setting operator is slidable by the user's finger or a touch pen along the virtual track with the indicator of the capacity operating rate simultaneously showing instantaneous state of a changing capacity operating rate while the sliding motion of the free setting operator is being conducted, wherein the state shown in the indicator of the capacity operating rate can be the operating percentage, the operating chart or the actual operating value of the at least one operating parameter, wherein the full length of the virtual track represents a simulation of the value of the maximum operating capacity of the at least one operating parameter, wherein the capacity operating rate is determined by a parking location of the free setting operator on the virtual track when the sliding motion stops.

30. The LED security light according to claim 28, wherein the capacity scale simulator is a capacity free running process and the free setting operator is a virtual button, wherein the free setting algorithm is implemented by the virtual button, the capacity free running process interacting with the virtual button and an indicator of the capacity operating rate, wherein the virtual button is designed on the touch screen panel of the mobile device, wherein when the virtual button is continuously touched by a user's finger or a touch pen, the user interface APP operates to activate the capacity free running process to gradually increase the capacity operating rate from a minimum level to a maximum level and then from the maximum level to the minimum level to complete a full cycle of free running motion, wherein during a free running cycle period the instantaneous state of a stepwise changing capacity operating rate is simultaneously shown in the indicator of the capacity operating rate, wherein the state of the capacity operating rate can be the operating percentage, the operating chart or the actual operating value of at least one the operating parameter, wherein the moment at which the user's finger or the

US 10,667,367 B2

43

touch pen is removed from the virtual button, the free running motion is instantly ceased with the capacity operating rate thereby being locked in at the instantaneous level of the last step of the free running motion, wherein the time length of a half cycle period of the free running motion represents a simulation of the value of the maximum operating capacity of the operating parameter wherein the capacity operating rate is determined by the time length of the user's finger or the touch pen staying in touch screen panel with the virtual button compared with the time length of a half cycle period of the free running motion.

31. The LED security light according to claim 26, wherein the wireless receiver is a Wi-Fi wireless external control signal receiver, a Blue Tooth wireless receiver, a Zig Bee wireless receiver or a RF wireless receiver.

32. The LED security light according to claim 26, wherein the at least one operating parameter is for setting a timer for performing a manual override illumination mode, wherein the security light is controlled by the photo sensor and the timer for performing a general illumination mode with the motion sensor being temporarily disabled before switching to perform a motion sensing illumination mode.

33. The LED security light according to claim 32, wherein the timer is a time length setting timer or a clock time setting timer.

34. The LED security light according to claim 26, wherein the at least one operating parameter is for setting the preset time period for performing the high level illumination mode.

35. The LED security light according to claim 26, wherein the at least one operating parameter is for setting the detection distance of the motion sensor.

36. The LED security light according to claim 26, wherein the at least one operating parameter is for setting the light intensity of the high level illumination mode.

37. The LED security light according to claim 26, wherein the at least one operating parameter is for setting a color temperature of the high level illumination mode; wherein the light emitting unit is composed of the first LED lighting load emitting light with the first color temperature and a second LED lighting load emitting light with a second color temperature, wherein the second color temperature is higher than the first color temperature, wherein the first LED lighting load and the second LED lighting load are electrically connected in parallel covered by a light diffuser to create an effect of a mingled light color temperature; wherein the switching circuitry comprises the first unidirectional semiconductor switching device and a second unidirectional semiconductor switching device respectively connected to the first LED lighting load and the second LED lighting load, wherein the controller in response to the at least one wireless instructional signal of the at least one operating variable received from the wireless external control signal receiver operates to activate a color temperature tuning process to respectively control different conduction rates between the first semiconductor switching device and the second semiconductor switching device to manage electric powers respectively allocated to the first LED lighting load and the second LED lighting load for tuning the mingled light color temperature, wherein for performing a power allocation between the first LED lighting load and the second LED lighting load the conduction rate of the first unidirectional semiconductor switching device and the conduction rate of the second unidirectional semiconductor switching device are reversely and complementarily adjusted such that a total electric power delivered to the light emitting unit remains essentially unchanged.

44

38. The LED security light according to claim 26, wherein the mobile device is a mobile phone, a pad, a PDA, a notebook, a smart watch, a smart speaker or a remote controller, featured with a capacity to download the user interface APP from an Internet or a cloud server for controlling and setting the at least one operating parameter of the LED security light.

39. The LED security light according to claim 38, wherein the free setting algorithm of the user interface APP is a voice recognition software preloaded in the smart speaker from the internet or the cloud server to transform a voice instruction of the user's setting decision into at least one operating variable of the at least one operating parameter of the LED security light and convert the at least one operating variable into the at least one wireless instruction signal for transmitting to the wireless external control signal receiver of the LED security light.

40. An LED security light, comprising:

a light emitting unit, comprising at least a first LED lighting load emitting light with a first color temperature;

a loading and power control unit;

a photo sensor;

a power supply unit; and

an external control unit, electrically coupled with the loading and power control unit;

wherein the loading and power control unit comprises a controller and a switching circuitry, wherein the controller is electrically coupled with the photo sensor and the switching circuitry; wherein the switching circuitry comprises at least a first unidirectional semiconductor switching device; wherein the switching circuitry is electrically connected between a power source of the power supply unit and the at least one lighting load, wherein the power source is a DC power source, wherein the controller outputs control signals to control the switching circuitry for delivering different electric power(s) to the light emitting unit for performing different illumination modes with different light intensities according to control signal(s) received from the photo sensor and the external control unit;

wherein when an ambient light detected by the photo sensor is lower than a first predetermined value, the light emitting unit is thereby turned on by the loading and power control unit to generate an illumination;

wherein when the ambient light detected by the photo sensor is higher than a second predetermined value, the lighting load is thereby turned off by the loading and power control unit;

wherein the external control unit is a wireless external control signal receiver electrically coupled with the controller to receive, decode and convert at least one wireless instruction signal into at least one value of at least one operating variable interpretable to the controller, wherein the controller is programmed with an APP for the LED security light for processing the at least one value of the at least one operating variable for setting at least one operating parameter according to the at least one operating variable received from the wireless external control signal receiver, wherein the at least one operating variable represents a setting decision by a user for choosing at least one capacity operating rate for operating at least one functional performance of the at least one operating parameter of the LED security light set by the user through a mobile device, wherein the at least one operating parameter is used for controlling at least one of functional performance settings

US 10,667,367 B2

45

of the LED security light including a timer setting, a light intensity setting and/or a color temperature setting.

41. The LED security light according to claim 40, wherein the wireless receiver is a Wi-Fi wireless external control signal receiver, a Blue Tooth wireless receiver, a Zig Bee wireless receiver or a RF wireless receiver.

42. The LED security light according to claim 40, wherein the at least one operating parameter is for controlling the time length of the illumination activated by the photo sensor.

43. The LED security light according to claim 40, wherein the at least one operating parameter is for setting the light intensity of the illumination activated by the photo sensor.

44. The LED security light according to claim 40, wherein the at least one operating parameter is for setting a color temperature of the illumination activated by the photo sensor; wherein the light emitting unit is composed of the first LED lighting load emitting light with the first color temperature and a second LED lighting load emitting light with a second color temperature, wherein the second color temperature is higher than the first color temperature, wherein the first LED lighting load and the second LED lighting load are electrically connected in parallel covered by a light diffuser to create an effect of a mingled light color temperature; wherein the switching circuitry comprises the first unidirectional semiconductor switching device and a second unidirectional semiconductor switching device respectively connected to the first LED lighting load and the second LED lighting load, wherein the controller in response to the at least one wireless instructional signal of the at least one operating variable received from the wireless external control signal receiver operates to activate a color temperature tuning process to respectively control different conduction rates between the first unidirectional semiconductor switching device and the second unidirectional semiconductor switching device to manage electric powers respectively allocated to the first LED lighting load and the second LED lighting load for tuning the mingled light color temperature, wherein for performing a power allocation between the first LED lighting load and the second LED lighting load the conduction rate of the first unidirectional semiconductor switching device and the conduction rate of the second unidirectional semiconductor switching device are reversely and complementarily adjusted such that a total electric power delivered to the light emitting unit remains essentially unchanged.

45. The LED security light according to claim 40, further comprising:

a user interface APP comprising at least one free setting algorithm preloaded in the mobile device to transform at least one user's setting decision into at least one operating variable;

wherein when the user interface APP is activated and concluded with the at least one user's setting decision, the user interface APP manages to transmit via the mobile device at least one wireless instruction signal carrying at least one message of the at least one operating variable to the LED security light, wherein the at least one operating variable is used for processing or setting the at least one operating parameter of the LED security light.

46. The LED security light according to claim 45, wherein the user interface APP is operable on a touch screen panel of the mobile device, wherein the free setting algorithm is a capacity scale simulation process implemented by a visual configuration of a free setting operator incorporated with a capacity scale simulator and an indicator of capacity oper-

46

ating rate to facilitate making the at least one user's setting decision in setting at least one desired level of the at least one operating parameter, wherein when the free setting operator is activated by the user to interact with the capacity scale simulator, the user interface APP responsively manages to gradually adjust the value of the capacity operating rate according to an instantaneous state of interaction between the free setting operator and the capacity scale simulator with the indicator of the capacity operating rate simultaneously showing the instantaneous state of the capacity operating rate, wherein the capacity operating rate shown in the indicator can be an operating percentage, an operating chart or an actual operating value of the at least one operating parameter, wherein when a free setting motion of the free setting operator is ceased, the user interface APP manages to generate the at least one operating variable corresponding to a selection of the at least one capacity operating rate and accordingly operates to transmit at least one wireless instruction signal carrying at least one message of the at least one operating variable to the LED security light.

47. The LED security light according to claim 46, wherein the capacity scale simulator is a virtual track, wherein the free setting algorithm is implemented by the visual configuration of the free setting operator, the virtual track coupled with the free setting operator and the indicator of the capacity operating rate, wherein the free setting operator is slidable by the user's finger or a touch pen along the virtual track with the indicator of the capacity operating rate simultaneously showing instantaneous state of the changing capacity operating rate while the sliding motion of the free setting operator is being conducted, wherein the state shown in the indicator of the capacity operating rate can be the operating percentage, the operating chart or the actual operating value of the at least one operating parameter, wherein a full length of the virtual track represents a simulation of the value of the maximum operating capacity of the at least one operating parameter, wherein the capacity operating rate is determined by a parking location of the free setting operator on the virtual track when the sliding motion stops.

48. The LED security light according to claim 46, wherein the capacity scale simulator is a capacity free running process and the free setting operator is a virtual button, wherein the free setting algorithm is implemented by the visual configuration of the virtual button, the capacity free running process integrated with the virtual button and an indicator of the capacity operating rate, wherein the virtual button is designed on the touch screen panel of the mobile device, wherein when the virtual button is continuously touched by a user's finger or a touch pen, the user interface APP operates to activate the capacity free running process to gradually increase the capacity operating rate from a minimum level to a maximum level and then from the maximum level to the minimum level to complete a full cycle of free running motion, wherein during a free running cycle period the instantaneous state of the changing capacity operating rate is simultaneously shown in the indicator of the capacity operating rate, wherein the state of capacity operating rate can be the operating percentage, the operating chart or the actual operating value of the at least one operating parameter, wherein the moment at which the user's finger or the touch pen is removed from the virtual button, the free running motion is instantly ceased with the capacity operating rate thereby being locked in at the instantaneous level of the last moment of the free running motion, wherein the time length of a half cycle period of the free running motion represents a simulation of the value of the maximum oper-

US 10,667,367 B2

47

ating capacity of a relevant operating parameter, wherein the capacity operating rate is determined by the time length the user's finger or the touch pen staying in touch screen panel with the virtual button compared with the time length of a half cycle period of the free running motion.

49. The LED security light according to claim 40, wherein the controller is a microcontroller programmable for generating the control signal.

50. The LED security light according to claim 40, wherein the controller is an application specific integrated circuit (ASIC) customized for generating the control signal.

51. The LED security light according to claim 40, wherein the mobile device is a mobile phone, a pad, a PDA, a notebook, a smart watch, a smart speaker or a remote controller, featured with a capacity to download the user interface APP from an Internet or a cloud server for controlling and setting the at least one operating parameter of the LED security light.

52. The LED security light according to claim 51, wherein the free setting algorithm of the user interface APP is a voice recognition software preloaded in the smart speaker from the internet or the cloud server to transform a voice instruction of the user's setting decision into at least one operating variable of the at least one operating parameter of the LED security light and convert the at least one operating variable into the at least one wireless instruction signal for transmitting to the wireless external control signal receiver of the LED security light.

53. An on line free setting method for setting at least one operating parameter of a ceiling fan with light kit, comprising:

a user interface APP comprising at least one free setting algorithm preloaded in a mobile device to transform a user's setting decision into at least one operating variable of the at least one operating parameter of the ceiling fan with light kit;

wherein when the user interface APP is activated and concluded with at least one setting decision, the user interface APP manages to transmit via the mobile device at least one wireless instruction signal carrying at least one message of the at least one operating variable to the ceiling fan with light kit, wherein the at least one operating variable is used for processing at least one value of the at least one operating parameter of the ceiling fan with light kit; and

a controller of the ceiling fan with light kit, designed with a capacity to interpret the at least one wireless instruction signal received by a wireless external control signal receiver of the ceiling fan with light kit and accordingly manages to output at least one control signal to control and set the at least one value of at least one operating parameter of the ceiling fan with light kit;

wherein the at least one value of the at least one operating parameter is stored in a memory of the controller for repetitive performance, wherein the at least one value of the at least one operating parameter stored is replaceable by a processing of new operating variable(s) selected by the user;

wherein the at least one operating parameter is used for controlling at least one of various lighting and electrical characteristics of the ceiling fan with light kit including timer setting, fan speed setting, fan rotation direction setting, light intensity setting and light color temperature setting;

wherein the user interface APP is operable on a touch screen panel of the mobile device, wherein the free

48

setting algorithm is a capacity scale simulation process implemented by a visual configuration of a free setting operator incorporated with a capacity scale simulator and an indicator of a capacity operating rate to facilitate the user's decision making process in setting a desired level of the at least one operating parameter, wherein when the free setting operator is activated by the user to interact with the capacity scale simulator, the user interface APP responsively manages to gradually and stepwise adjust a value of the capacity operating rate according to an instantaneous state of interaction between the free setting operator and the capacity scale simulator with the indicator of the capacity operating rate simultaneously showing the instantaneous state of a stepwise changing capacity operating rate, wherein the capacity operating rate shown in the indicator can be an operating percentage, an operating chart or an actual operating value of a relevant operating parameter, wherein when a free setting motion of the free setting operator is ceased, the user interface APP manages to generate the at least one operating variable corresponding to a selection of the capacity operating rate and accordingly operates to transmit the at least one wireless instruction signal carrying the at least one message of the at least one operating variable to the ceiling fan with light kit.

54. The on line free setting method for setting at least one operating parameter of a ceiling fan with light kit according to claim 53, wherein the mobile device is a mobile phone, a pad, a PDA, a notebook, a smart watch, a smart speaker or a remote controller featured with a capacity to download the user interface APP from an Internet or a cloud server for controlling and setting the at least one operating parameter of the ceiling fan with light kit.

55. The on line free setting method for setting at least one operating parameter of a ceiling fan with light kit according to claim 54, wherein the free setting algorithm of the user interface APP is a voice recognition software preloaded in the smart speaker from the internet or the cloud server to transform a voice instruction of the user's setting decision into at least one operating variable of the at least one operating parameter of the ceiling fan with light kit and convert the at least one operating variable into the at least one wireless instruction signal for transmitting to the wireless external control signal receiver of the ceiling fan with light kit.

56. The on line free setting method for setting at least one operating parameter of a ceiling fan with light kit according to claim 53, wherein the ceiling fan is a DC motor fan and the light kit is a LED lighting device.

57. The on line free setting method for setting at least one operating parameter of a ceiling fan with light kit according to claim 30, wherein the capacity scale simulator is a virtual track, wherein the free setting algorithm is implemented by the visual configuration of the free setting operator, the virtual track coupled with the free setting operator and the indicator of the capacity operating rate, wherein the free setting operator is slidable by the user's finger or a touch pen along the virtual track with the indicator of the capacity operating rate simultaneously showing the instantaneous state of the changing capacity operating rate while the sliding motion of the free setting operator is being conducted, wherein the state shown in the indicator of the capacity operating rate can be the operating percentage, the operating chart or the actual operating value of the at least one operating parameter, wherein the full length of the virtual track represents a simulation of the value of the

US 10,667,367 B2

49

maximum operating capacity of the at least one operating parameter, wherein the capacity operating rate is determined by a parking location of the free setting operator on the virtual track when the sliding motion stops.

58. The on line free setting method for setting at least one operating parameter of a ceiling fan with light kit according to claim 30, wherein the capacity scale simulator is a capacity free running process and the free setting operator is a virtual button, wherein the free setting algorithm is implemented by the visual configuration of the virtual button, the capacity free running process integrated with the virtual button and the indicator of the capacity operating rate, wherein the virtual button is designed on the touch screen panel of the mobile device, wherein when the virtual button is continuously touched by a user's finger or a touch pen, the user interface APP operates to activate the capacity free running process to gradually increase the capacity operating rate from a minimum level to a maximum level and then from the maximum level to the minimum level to complete a full cycle of free running motion, wherein during a free running cycle period the instantaneous state of the changing capacity operating rate is simultaneously shown in the indicator of the capacity operating rate, wherein the state of capacity operating rate can be the operating percentage, the operating chart or the actual operating value of the at least one operating parameter, wherein the moment at which the user's finger or the touch pen is removed from the virtual button, the free running motion is instantly ceased with the

50

capacity operating rate thereby being locked in at an instantaneous level of the last moment of the free running motion, wherein the time length of a half cycle period of the free running motion represents a simulation of the value of the maximum operating capacity of a relevant operating parameter, wherein the capacity operating rate is determined by the time length the user's finger or the touch pen staying in touch screen panel with the virtual button compared with the time length of a half cycle period of the free running motion.

59. The on line free setting method for setting at least one operating parameter of a ceiling fan with light kit according to claim 30, wherein the mobile device is a mobile phone, a pad, a PDA, a notebook, a smart watch, a smart speaker or a remote controller, featured with a capacity to download the user interface APP from an Internet or a cloud server.

60. The on line free setting method for setting at least one operating parameter of a ceiling fan with light kit according to claim 59, wherein the free setting algorithm of the user interface APP is a voice recognition software preloaded in the smart speaker from the internet or the cloud server to transform a voice instruction of the user's setting decision into at least one operating variable of the at least one operating parameter of the ceiling fan with light kit and convert the at least one operating variable into the at least one wireless instruction signal for transmitting to the wireless external control signal receiver of the ceiling fan with light kit.

* * * * *

EXHIBIT K



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Chen

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(45) **Date of Patent:** ***Jan. 31, 2017**

(54) **LED SECURITY LIGHT AND LED SECURITY LIGHT CONTROL DEVICE THEREOF**

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(72) Inventor: **Chia-Teh Chen**, Taipei (TW)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

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(63) Continuation of application No. 14/487,334, filed on Sep. 16, 2014, now Pat. No. 9,326,362, which is a continuation-in-part of application No. 13/222,090, filed on Aug. 31, 2011, now Pat. No. 8,866,392.

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H05B 33/08 (2006.01)

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(52) **U.S. Cl.**

CPC **H05B 37/0218** (2013.01); **G08B 15/00** (2013.01); **H05B 33/0815** (2013.01); **H05B 33/0818** (2013.01); **H05B 33/0824** (2013.01); **H05B 33/0827** (2013.01); **H05B 33/0854** (2013.01); **H05B 33/0872** (2013.01); **H05B 37/0227** (2013.01); **H05B 37/0272** (2013.01); **H05B 37/0281** (2013.01); **G08B 13/189** (2013.01); **Y02B 20/346** (2013.01); **Y02B 20/40** (2013.01); **Y02B 20/42** (2013.01); **Y02B 20/44** (2013.01); **Y02B 20/46** (2013.01)

(58) **Field of Classification Search**

CPC H05B 33/0854; H05B 33/0815; H05B 37/0245

USPC 315/149, 150, 152, 153, 291, 308, 360; 340/541, 565

See application file for complete search history.

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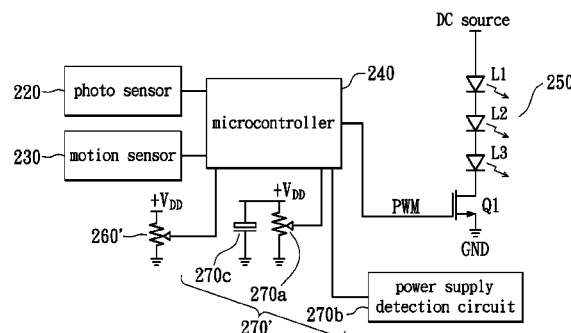
Primary Examiner — Thuy Vinh Tran

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(57) **ABSTRACT**

A two-level LED security light includes a power supply unit, a motion sensor unit, a time setting unit, a loading and power control unit, an external control unit, and a lighting-emitting unit. The LED security light is turned on at dusk for generating a first level illumination and turned off at dawn. When the motion sensor detects any intrusion, the LED security light is switched from the first level illumination to a second level illumination for a short duration time to scare away the intruder. After the short duration time, the LED security light returns to the first level illumination for saving energy. The light emitting unit includes one or a plurality of LEDs. The time setting unit is for managing illumination timing. The external control unit is for setting illumination characteristics of the first level illumination or the second level illumination of the light emitting unit.

62 Claims, 7 Drawing Sheets



US 9,560,719 B2

Page 2

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U.S. Patent

Jan. 31, 2017

Sheet 1 of 7

US 9,560,719 B2

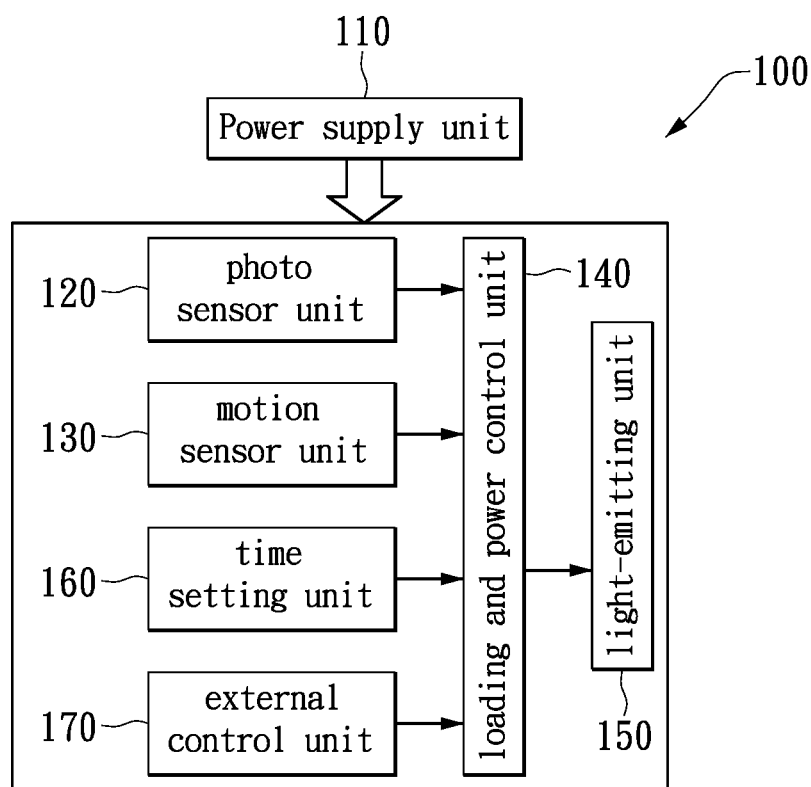


FIG. 1

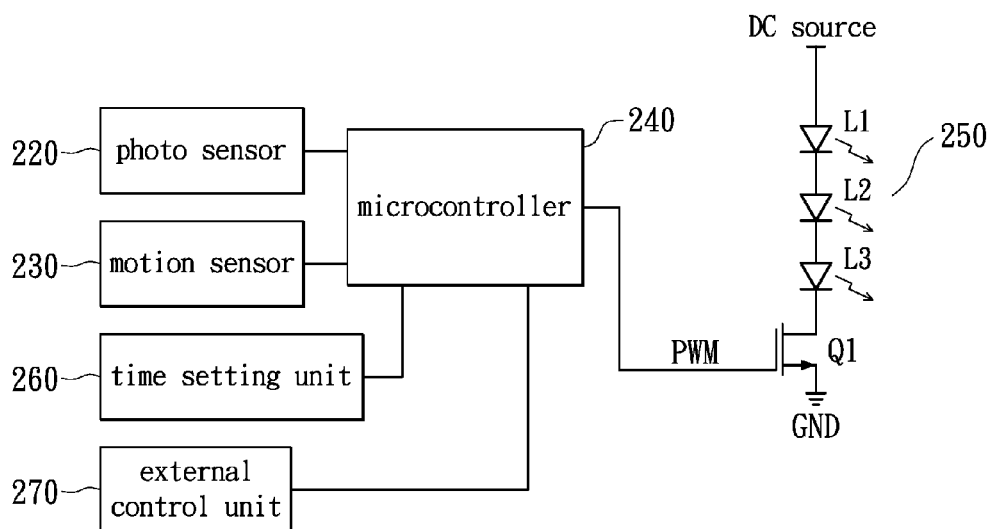


FIG. 2A

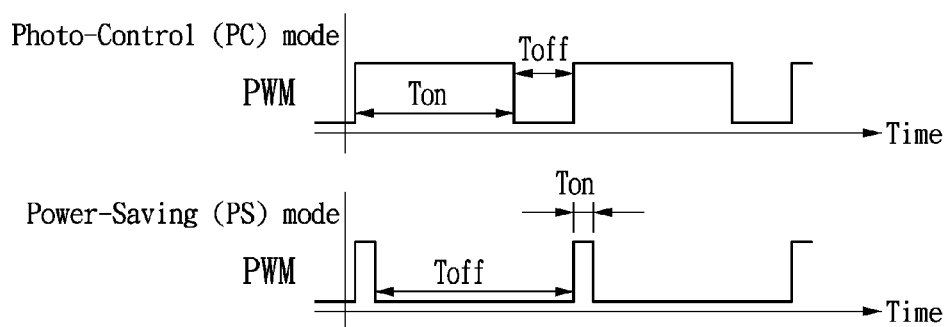


FIG. 2B

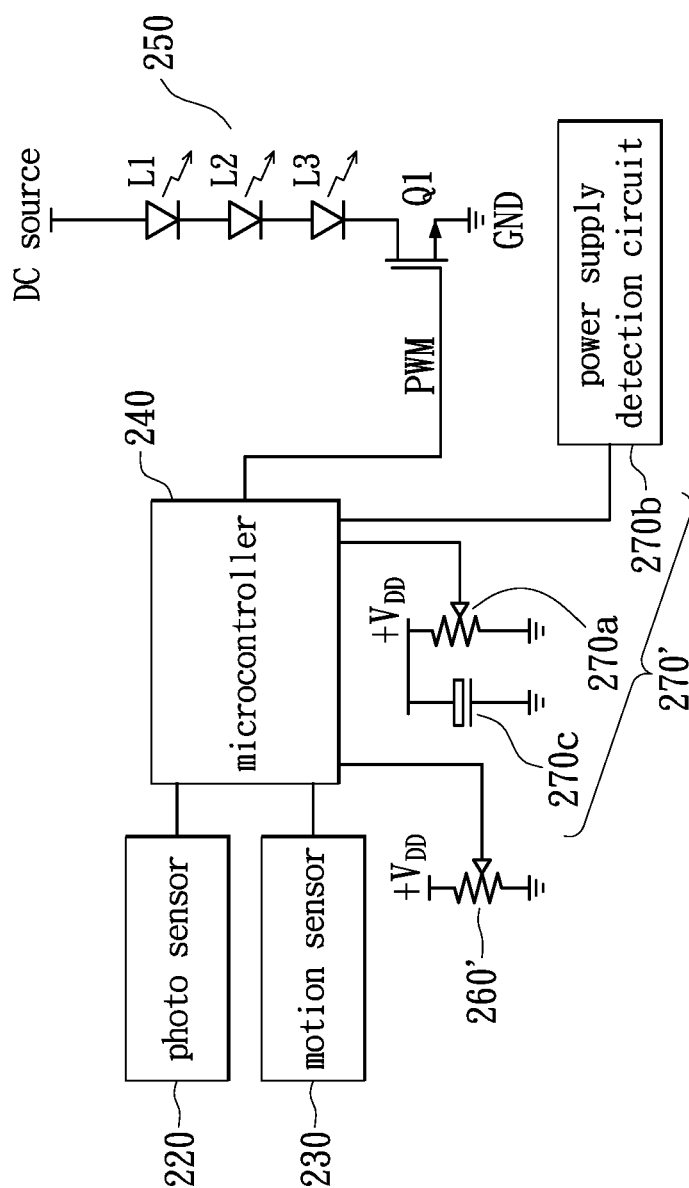


FIG. 2C

U.S. Patent

Jan. 31, 2017

Sheet 4 of 7

US 9,560,719 B2

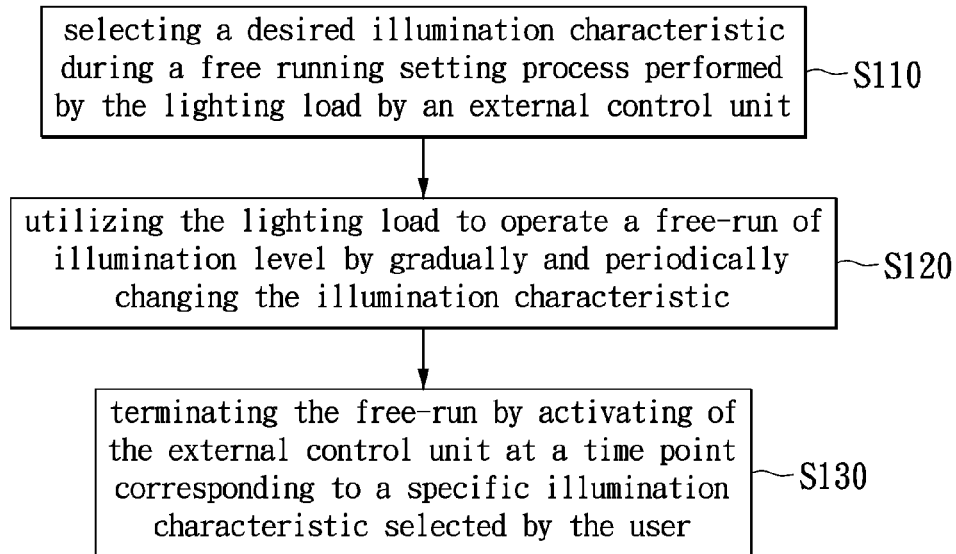


FIG. 2D

U.S. Patent

Jan. 31, 2017

Sheet 5 of 7

US 9,560,719 B2

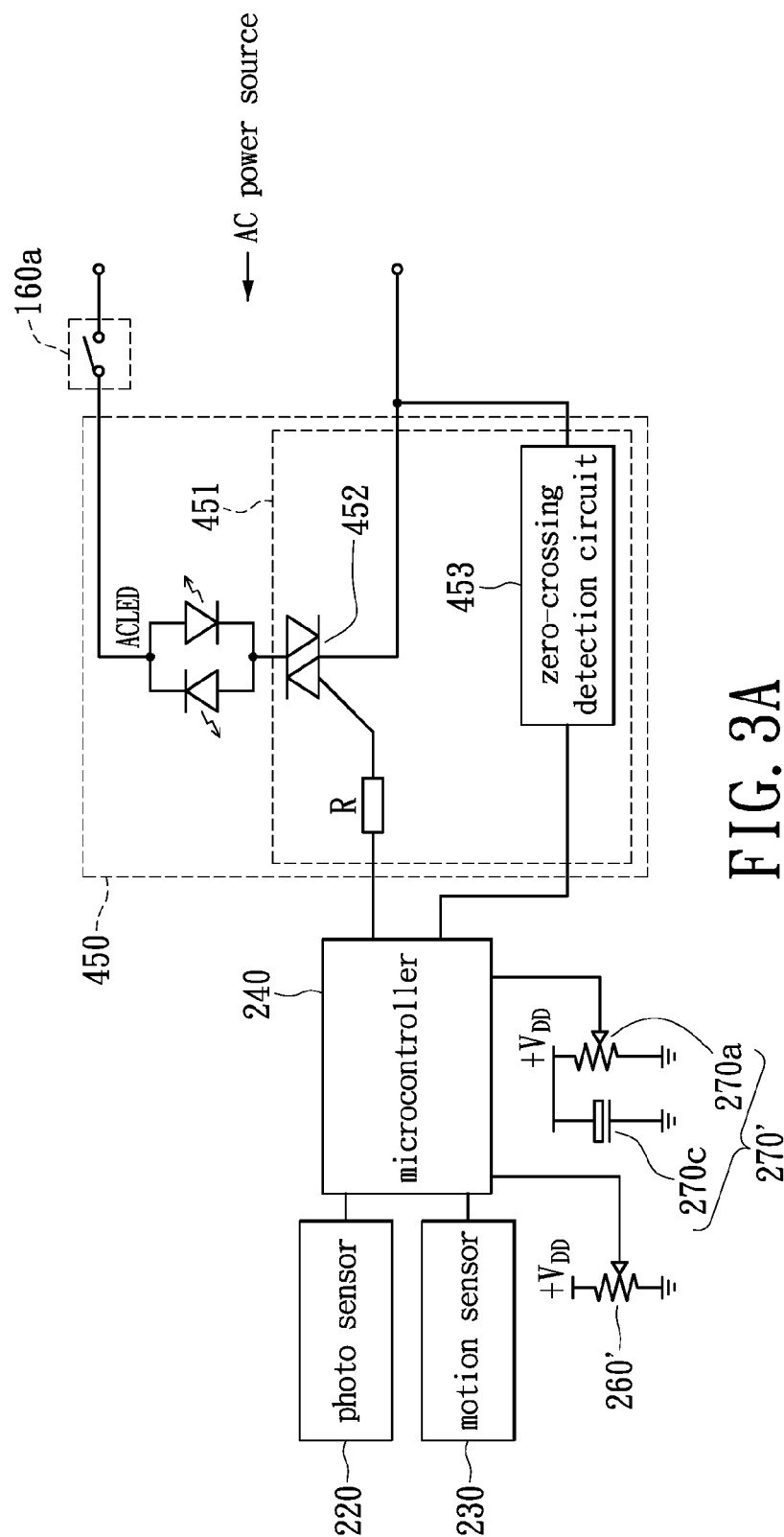


FIG. 3A

U.S. Patent

Jan. 31, 2017

Sheet 6 of 7

US 9,560,719 B2

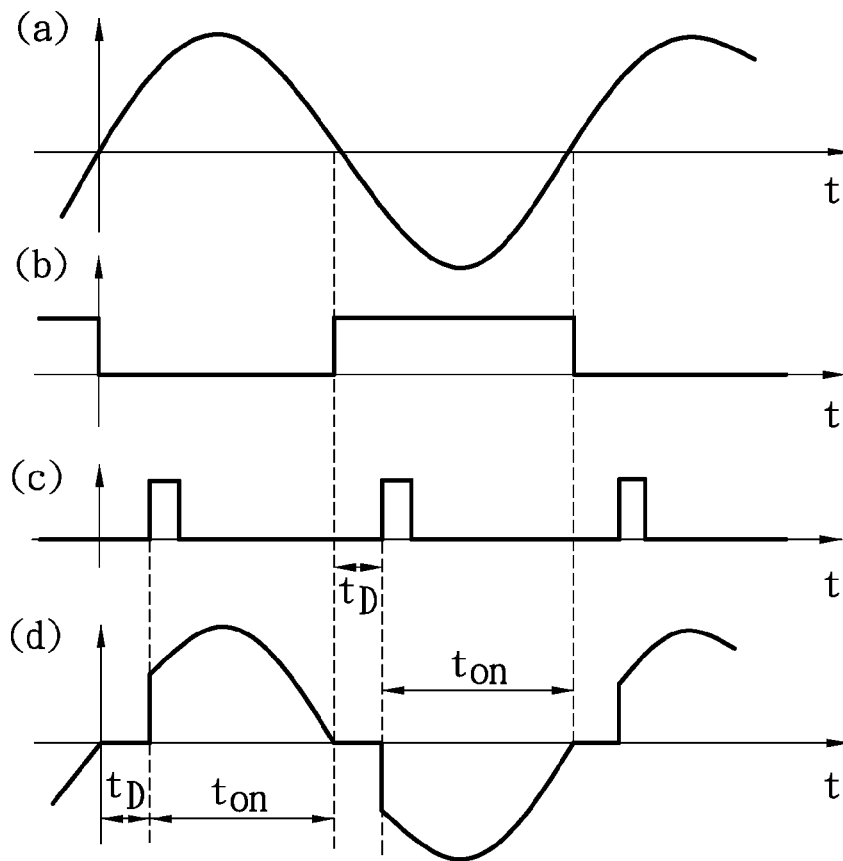


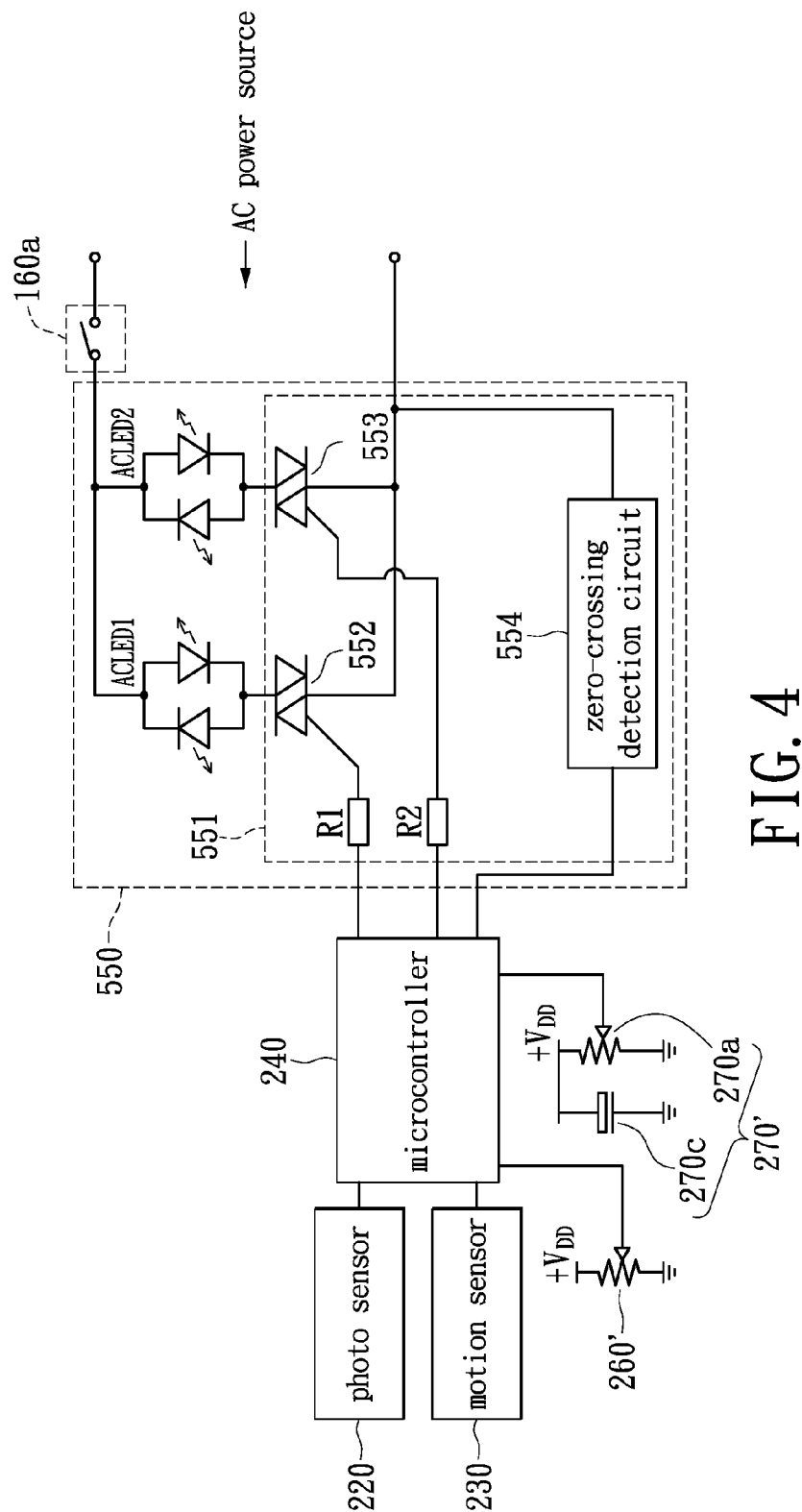
FIG. 3B

U.S. Patent

Jan. 31, 2017

Sheet 7 of 7

US 9,560,719 B2



US 9,560,719 B2

1

LED SECURITY LIGHT AND LED SECURITY LIGHT CONTROL DEVICE THEREOF

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of Non-provisional application Ser. No. 14/487,334 filed on Sep. 16, 2014, which is now U.S. Pat. No. 9,326,362. The U.S. Pat. No. 9,326,362 is a continuation-in-part of U.S. Pat. No. 8,866,392 filed on Aug. 31, 2011.

BACKGROUND

1. Technical Field

The present disclosure relates to a lighting apparatus, in particular, to a two-level security LED light with motion sensor

2. Description of Related Art

Lighting sources such as the fluorescent lamps, the incandescent lamps, the halogen lamps, and the light-emitting diodes (LED) are commonly found in lighting apparatuses for illumination purpose. Photoresistors are often utilized in outdoor lighting applications for automatic illuminations, known as the Photo-Control (PC) mode. Timers may be used in the PC mode for turning off the illumination or for switching to a lower level illumination of a lighting source after the lighting source having delivered a high level illumination for a predetermined duration, referred as the Power-Saving (PS) mode. Motion sensors are often used in the lighting apparatus for delivering full-power illumination thereof for a short duration when a human motion is detected, then switching back to the PS mode. Illumination operation controls such as auto-illumination in accordance to the background brightness detection, illumination using timer, illumination operation control using motion sensing results (e.g., dark or low luminous power to fully illuminated), and brightness control are often implemented by complex circuitries. In particular, the design and construction of LED drivers are still of a complex technology with high fabrication cost.

Therefore, how to develop a simple and effective design method on illumination controls such as enhancing contrast in illumination and color temperature for various types lighting sources, especially the controls for LEDs are the topics of the present disclosure.

SUMMARY

An exemplary embodiment of the present disclosure provides a two-level LED security light with motion sensor which may switch to a second level illumination in the Power-Saving (PS) mode for a predetermined duration time when a human motion is detected thereby achieve warning purpose using method of electric current or lighting load adjustment. Furthermore, prior to the detection of an intrusion, the LED security light may be constantly in a first level illumination to save energy.

An exemplary embodiment of the present disclosure provides a two-level LED security light, comprising a light emitting unit, a loading and power control unit, a photo sensor unit, a motion sensor unit, a power supply unit, and an external control unit coupled with the loading and power control unit. The light emitting unit comprises at least one LED, or the light emitting unit is a LED lamp. The loading and power control unit comprises a microcontroller electrically

2

cally coupled with a semiconductor switching device, wherein the semiconductor switching device is electrically connected in series with the power supply unit and the light emitting unit, wherein the microcontroller with program codes outputs a pulse width modulation (PWM) signal to a gate electrode of the semiconductor switching device to control the conduction period T_{on} and the cut-off period T_{off} of the semiconductor switching device for delivering different average electric currents from the power supply unit to drive the light emitting unit for generating different illuminations, wherein the microcontroller controls the semiconductor switching device respectively to have a first T_{on} and a second T_{on} of the conduction period such that the light emitting unit respectively generates a first level and a second level illumination characterized by light intensity and/or color temperature according to the received signal outputted from the photo sensor unit and the motion sensor unit, wherein the external control unit is for setting illumination characteristics of at least one of the first level illumination and the second level illumination of the light emitting unit.

Another exemplary embodiment of the present disclosure provides a two-level security light control device applicable to AC lighting sources, comprising a power supply unit, a photo sensor unit, a motion sensor unit, a loading and power control unit, a zero-crossing detection circuit, a phase controller, and an external control unit coupled with the loading and power control unit. The phase controller is in-series connected to an AC lighting source and an AC power source, wherein the loading and power control unit comprises a microcontroller for writing operation program to control a conduction period of the phase controller thereby to adjust the average power of the AC lighting source, wherein when an ambient light detected by the photo sensor unit is lower than a predetermined value, the AC lighting source is turned on by the loading and power control unit thereby to generate a first level illumination and when the ambient light detected by the photo sensor unit is higher than the predetermined value, the AC lighting source is turned off by the loading and power control unit; when an intrusion is detected by the motion sensor unit, the loading and power control unit changes the average power of the AC lighting source and a second level illumination is generated for a predetermined duration, wherein the first level and the second level illumination are characterized by specific light intensity and/or color temperature, wherein the external control unit is for setting illumination characteristics of at least one of the first level illumination and the second level illumination of the light emitting unit.

Another one exemplary embodiment of the present disclosure provides a two-level security light control device applicable to AC lighting sources, comprising a power supply unit, a photo sensor unit, a motion sensor unit, a loading and power control unit, a zero-crossing detection circuit, a plurality of phase controllers, and an external control unit coupled with the loading and power control unit. The plurality of phase controllers are respectively series-connected to a plurality of alternating current (AC) lighting sources, wherein the pairs of phase controller-AC lighting source are parallel-connected to an AC power source, wherein the loading and power control unit comprises a microcontroller for writing operation program to respectively control conduction periods of the phase controllers thereby to respectively adjust the average powers of the AC lighting sources, wherein when an ambient light detected by the photo sensor unit is lower than a predetermined value, the AC lighting sources are turned on by the loading and power control unit to generate a first level illumination for

US 9,560,719 B2

3

a predetermined duration and when the ambient light detected by the photo sensor unit is higher than the predetermined value, the AC lighting sources are turned off, wherein when an intrusion is detected by the motion sensor unit, the loading and power control unit changes the average power of the AC lighting sources to generate a second level illumination for a predetermined duration, wherein the first level and the second level illumination are characterized by specific light intensity and color temperature, wherein the external control unit is for setting the illumination characteristics of at least one of the first level illumination and the second level illumination of the AC lighting sources.

To sum up, a two-level LED security light with motion sensor provided by an exemplary embodiment in the present disclosure, may execute Photo-Control (PC) and Power-Saving (PS) modes. The PC mode may generate a second level (high level, for example) illumination for a predetermined duration then automatically switch to the PS mode by a control unit to generate a first level (low level, for example) illumination. When the motion sensor detects a human motion, the disclosed LED security light may immediately switch to the second level illumination for a short predetermined duration thereby achieve illumination or warning effect. After the short predetermined duration, the LED security light may automatically return to the first level illumination for saving energy. Further, the illumination characteristics of at least one of the first level illumination and the second level illumination of the light emitting unit can be set by the user by means of an external control unit.

In order to further understand the techniques, means and effects of the present disclosure, the following detailed descriptions and appended drawings are hereby referred, such that, through which, the purposes, features and aspects of the present disclosure can be thoroughly and concretely appreciated; however, the appended drawings are merely provided for reference and illustration, without any intention to be used for limiting the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings are included to provide a further understanding of the present disclosure, and are incorporated in and constitute a part of this specification. The drawings illustrate exemplary embodiments of the present disclosure and, together with the description, serve to explain the principles of the present disclosure.

FIG. 1 schematically illustrates a block diagram of a two-level LED security light in accordance with an exemplary embodiment of the present disclosure.

FIG. 2A illustrates a schematic diagram of a two-level LED security light in accordance to the first exemplary embodiment of the present disclosure.

FIG. 2B graphically illustrates a timing waveform of a pulse width modulation (PWM) signal in accordance to the first exemplary embodiment of the present disclosure.

FIG. 2C illustrates in some detail a schematic diagram of a two-level LED security light of FIG. 2A.

FIG. 2D illustrates a flow chart of a free running setting method in accordance to the first exemplary embodiment of the present disclosure.

FIG. 3A illustrates a schematic diagram of a two-level LED security light in accordance to the second exemplary embodiment of the present disclosure.

FIG. 3B illustrates a timing waveform of two-level LED security light in accordance to the second exemplary embodiment of the present disclosure.

4

FIG. 4 illustrates a schematic diagram of a two-level LED security light in accordance to the second exemplary embodiment of the present disclosure.

DESCRIPTION OF THE EXEMPLARY EMBODIMENTS

Reference is made in detail to the exemplary embodiments of the present disclosure, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers are used in the drawings and the description to refer to the same or alike parts.

(First Exemplary Embodiment)

Refer to FIG. 1, which schematically illustrates a block diagram of a two-level LED security light in accordance to the first exemplary embodiment of the present disclosure. A two-level LED security light (herein as the lighting apparatus) 100 includes a power supply unit 110, a photo sensor unit 120, a motion sensor unit 130, a loading and power control unit 140, a light emitting unit 150, a time setting unit 160 and an external control unit 170. The power supply unit 110 is used for supplying power required to operate the system, wherein the associated structure includes the known AC/DC power converter. The external control unit 170 is coupled with the loading and power control unit 140, wherein the external control unit 170 can be manipulated by the user for adjusting illumination characteristics of at least one of a first level illumination and a second level illumination of the light emitting unit 150. The first level and the second level illumination are characterized by light intensity and/or color temperature. For example, the first level illumination and the second level illumination may be a low level illumination (or no illumination) and a high level illumination respectively, but the present disclosure is not so restricted. In other embodiment, the first level illumination may be a first color temperature level illumination, and the second level illumination may be a second color temperature level illumination. The photo sensor unit 120 may be a photoresistor, which may be coupled to the loading and power control unit 140 for determining daytime or nighttime in accordance to the ambient light. The motion sensor unit 130 may be a passive infrared ray sensor (PIR) or microwave motion sensor, which is coupled to the loading and power control unit 140 and is used to detect intrusions. When a person is entering a predetermined detection zone of the motion sensor unit 130, a sensing signal thereof may be transmitted to the loading and power control unit 140.

The loading and power control unit 140 which is coupled to the light emitting unit 150 may be implemented by a microcontroller. The loading and power control unit 140 may control the illumination levels of the light emitting unit 150 in accordance to the sensing signal outputted by the photo sensor unit 120 and the motion sensor unit 130. The light emitting unit 150 may include a plurality of LEDs and switching components. The loading and power control unit 140 may control the light emitting unit 150 to generate at least two levels of illumination variations.

When the photo sensor unit 120 detects that the ambient light is lower than a predetermined value (i.e., nighttime), the loading and power control unit 140 executes the Photo-Control (PC) mode by turning on the light emitting unit 150 to generate a high level illumination for a predetermined duration then return to a low level illumination for Power-Saving (PS) mode. When the photo sensor unit 120 detects that the ambient light is higher than a predetermined value (i.e., dawn), the loading and power control unit 140 turns off the light emitting unit 150. In the PS mode, when the motion

US 9,560,719 B2

5

sensor unit **130** detects a human motion, the loading and power control unit **140** may increase the electric current which flows through the light emitting unit **150**, to generate a high level illumination for a short predetermined duration. After the short predetermined duration, the loading and power control unit **140** may automatically reduce the electric current that flows through the light emitting unit **150** thus to have the light emitting unit **150** return to low level illumination for saving energy.

Refer to FIG. 2A in view of FIG. 1, FIG. 2A illustrates a schematic diagram of a two-level LED security light in accordance to the first exemplary embodiment of the present disclosure. The photo sensor unit **120** may be implemented by a photo sensor **220**; the motion sensor unit **130** may be implemented by a motion sensor **230**; the loading and power control unit **140** may be implemented by a microcontroller **240**; the time setting unit **260** is the time setting unit **160**; and the external control unit **270** is the external control unit **170**. The light emitting unit **250** includes three series-connected LEDs **L1~L3**. The LEDs **L1~L3** is connected between a DC source and a transistor **Q1**, wherein an artisan of ordinary skill in the art will appreciate how to replace the transistor **Q1** by other type of the semiconductor switching device. The DC source may be provided by the power supply unit **110**. The transistor **Q1** may be an N-channel metal-oxide-semiconductor field effect transistor (NMOS). The transistor **Q1** is connected between the three series-connected LEDs **L1~L3** and a ground GND. The loading and power control unit **140** implemented by the microcontroller **240** may output a pulse width modulation (PWM) signal to the gate of transistor **Q1** to control the average electric current. It is worth to note that the electric components depicted in FIG. 2A only serves as an illustration for the exemplary embodiment of the present disclose and hence the present disclosure is not limited thereto. The external control unit **270** may be an electronic switch being optionally a push button, a touch panel or an infrared ray sensor for inputting voltage signal to adjust illumination characteristics of at least one of the first level illumination and the second level illumination of the light emitting unit. Further, in another embodiment, the external control unit **270** may be a push button, a touch panel, an infrared ray sensor or a wireless remote control device coupled or wirelessly linked to a pin of the microcontroller of the loading and power control unit; wherein, when the push button, the touch panel, the infrared ray sensor or the remote control device is activated, a voltage signal is generated to trigger the microcontroller **240** for performing at least one of the two functional modes, for instance the manual setting and the free-running setting (which would be explained thereafter) of the illumination characteristics. The external control unit **270** may be electrically coupled to the microcontroller **240** (that is the loading and power control unit **140**), such as utilizing electrically connection through conducting wire. In other embodiment, the external control unit **270** may be a remote control device, thus the external control unit **270** is wirelessly linked to the microcontroller **240** by using wireless techniques.

In addition, the microcontroller **240** is coupled to a time setting unit **260**, wherein the time setting unit **260** may allow the user to configure on software base a virtual timer embedded in the microcontroller **240** for executing a subroutine for a predetermined duration to perform the first level or the second level illumination respectively in the PC mode or in the PS mode. Further, if the microcontroller **240** is coupled to a clock device, the time setting unit **260** may allow the user to set a clock time point instead of a

6

predetermined duration for switching from the PC mode to the PS mode. However, the present disclosure is not limited thereto.

Refer to FIG. 2B concurrently, which graphically illustrates a timing waveform of a pulse width modulation (PWM) signal in accordance to the first exemplary embodiment of the present disclosure. In the PC mode, the PWM signal may be used to configure the transistor **Q1** to have the conduction period T_{on} being longer than the cut-off period T_{off} . On the other hand in the PS mode, the PWM signal may configure the transistor **Q1** to have the conduction period T_{on} being shorter than the cut-off period T_{off} . In comparison of the illumination levels between the PC and PS modes, as the conduction period T_{on} of transistor **Q1** being longer under the PC mode, therefore have higher average electric current driving the light emitting unit **250** thereby generate high illumination, which may be classified as the high level illumination; whereas as the conduction period T_{on} of transistor **Q1** is shorter in the PS mode, therefore have lower average electric current driving the light emitting unit **250** thereby generate low illumination, which may be classified as the low level illumination.

The microcontroller **240** turns off the light emitting unit **250** during the day and activates the PC mode at night by turning on the light emitting unit **250** to generate the high level illumination for a short predetermined duration then return to the low level illumination thereby entering the PS mode. When the motion sensor **230** detects a human motion in the PS mode, the light emitting unit **250** may switch to the high level illumination for illumination or warning application. The light emitting unit **250** may return to the low level illumination after maintaining at the high level illumination for a short predetermined duration to save energy.

Please refer to FIG. 2A to further elucidate illumination level adjustment or setting. In order to adjust the illumination level of the light emitting unit **250**, two exemplary control methods are applied by utilizing the external control unit **270**. Specifically, the first exemplary method is a manual adjustment applicable when the loading and power control unit **240** executes the Power-Saving (PS) mode for generating a first level illumination. The first level illumination is preferred an illumination of low light intensity and/or low color temperature. Refer to FIG. 2A again, the microcontroller **240** may scan with its program codes a pin connected with the external control unit **270** and may detect control signal generated from the external control unit **270**. The external control unit **270** may be preferable a push button. When the push button is pressed down by a user to ground the connecting pin of the microcontroller **270**, a zero voltage is generated for a time duration until the push button is released, such that a control signal with a zero voltage of a time duration is generated manually by the user. The microcontroller **240** with program codes recognizes this control signal and by executing a subroutine generates a PWM signal with a conduction time period T_{on} periodically varying within a preset range of 0 to 50% duty (T_{on} is equal to T_{off}) for a time length controlled by the external control unit **270**, such that the LEDs **250** generate illumination with light intensity level gradually and periodically increasing from zero to 50% of the maximum light intensity and then decreasing from 50% to zero to complete a repetitive cycle. The time length of such periodical illumination variation is equal to the time duration of zero voltage generated by pushing down the push button **270**. Only when the push button **270** is released by the user, the periodical illumination variation is ended at a illumination level related to a specific T_{on} value determined by the user; then the microcontroller

US 9,560,719 B2

7

240 jumps out of the subroutine of periodical illumination variation and stores thereafter the corresponding T_{on} value of the PWM signal in its memory to update a data base for generating a new first level illumination in the PS mode. In brief, by pressing down and releasing the push button **270** connected with a pin of the microcontroller **240**, the illumination level of the light emitting unit **250** can be thus set manually by the user when the loading and power control unit **240** executes the PS mode. However, the present disclosure is not limited thereto.

The second exemplary method is a free-running setting by program codes of microcontroller in conjunction with the external control unit. Refer to FIG. 2A. When the lighting apparatus is turned on by the photo sensor **220**, the microcontroller **240** starts its program codes by executing a subroutine in which PWM signal is generated with the conduction time period T_{on} periodically varying within a preset range of 0 to 50% duty for a fixed time period, such that the LEDs **250** generate illumination with light intensity level gradually and periodically increasing from zero to 50% of the maximum light intensity and then decreasing from 50% to zero light intensity to complete a variation cycle. This periodical variation of the low illumination level can last freely for two or three cycles within the fixed time period which is preferable to be one minute. However, it is not to limit the present invention in this manner. Within the one-minute fixed time period, for instance, the periodical illumination variation may be ended by activating the external control unit **270**. The external control unit **270** may be preferable a push button. When the push button is pressed down instantly by a user to ground the connecting pin of the microcontroller **270**, a zero voltage is generated to trigger the microcontroller **240** wherein the microcontroller **240** jumps out of the subroutine to terminate the free-running illumination variation and stores the T_{on} value of PWM signal corresponding to the time point when the external control unit **270** being activated. The stored T_{on} value is used to update a data base for generating the first level illumination in the PS mode. The free-run of periodical illumination variation may automatically end when the one-minute fixed time period expires with the external control unit **270** not being operated by the user; in this case, the microcontroller **240** jumps out of the subroutine of free-run and acquires from its memory a preset or earlier T_{on} value of PWM signal for generating the first level illumination in the PS mode until the lighting apparatus is turned off.

In brief, in a preferred embodiment of the present disclosure, a two-level LED security light may include a power supply unit, a photo sensor unit, a motion sensor unit, a loading and power control unit, a light emitting unit, a time setting unit and an external control unit. The external control unit is provided for adjusting or setting illumination level of LED light. The loading and power control unit is implemented by a microcontroller with program codes to operate the two-level LED security light. The microcontroller turns off the light emitting unit during the day and activates a Power-Saving (PS) mode at night by turning on the light emitting unit to generate a first level illumination, and upon human motion detection by switching the light emitting unit to generate a second level illumination for a short time duration. The illumination characteristics of first level illumination can be changed by activating the external control unit according to the user's demand. When the lighting apparatus is turned on, the microcontroller starts its program codes by firstly executing a subroutine with free-run for a fixed time length, such that the user can follow the gradual and periodical illumination variation to select an illumina-

8

tion level by operating the external control unit; thereafter, the microcontroller jumps out of the subroutine of free-run and executes the program codes of PS mode for generating the first level illumination with the selected level characteristics until the lighting apparatus is turned off. If within the fixed time length of free-run the external control unit is not activated, the microcontroller jumps out of the subroutine of free-run automatically and, with a data base of a preset or earlier level characteristics, executes program codes of PS mode for generating the first level illumination until the lighting apparatus is turned off. The level characteristics can also be further adjusted manually by the user when loading and power control unit executes the PS mode. The external control unit may be preferable a push button. When in PS mode the light emitting unit generates a first level illumination, the user can press the push button for a while to observe the gradual and periodical changing of level characteristic, and then decide at a time point to release the push button to select a desired illumination level, such that to complete manual adjustment.

Please refer to FIG. 2C in view of FIG. 2A and FIG. 2B. Two preferred constructions respectively for the time setting unit **260'** and the external control unit **270'** are shown in FIG. 2C. The time setting unit **260'** may be a voltage divider with variable resistor for setting predetermined time durations for the first level and the second level illumination. The external control unit **270'** may include a voltage divider **270a** which may comprise a variable resistor provided with a rotating knob to facilitate operation. For illumination level setting, the microcontroller operates with program codes preferably in conjunction with the voltage divider **270a** and further with a power supply detection circuit **270b**, an energy storage capacitor **270c** and a power switch (not shown in FIG. 2C) for respectively manual and free-running setting of at least one of a first level illumination and a second level illumination of the two-level LED security light; details of adjusting illumination level with the external control unit **270'** and other extra devices will be described later.

In order to adjust the illumination level of the light emitting unit **250**, two exemplary control methods are applied by utilizing the external control unit **270a** and the software technique incorporating with extra devices **270b-270c**. Specifically, the first exemplary method is a manual adjustment applicable in the Power-Saving (PS) mode for generating a first level illumination. Refer to FIG. 2C again, the microcontroller **240** may scan with its program codes the voltage on a pin connected with the voltage divider **270a** and may detect a voltage, in which the voltage across of the variable resistor (voltage divider **270a**) may be varied manually when a user rotates the knob attached on the variable resistor (voltage divider **270a**). The microcontroller **240** with program codes generates in response a PWM signal with a conduction time period T_{on} proportional to a voltage received from the variable resistor (voltage divider **270a**). The light emitting unit **250** illuminates accordingly with light intensity level characterized by the conduction time period T_{on} controlled by the voltage of the variable resistor (voltage divider **270a**). With the external control unit **270'**, the first illumination level of the light emitting unit **250** can be thus set manually by tuning the variable resistor (voltage divider **270a**) when the loading and power control unit **240** executes the PS mode.

The second exemplary method is a free-running adjustment based on program codes of microcontroller in conjunction with a power supply detection circuit and an energy-stored capacitor. Refer to FIG. 2C, when the lighting apparatus is turned on, the microcontroller **240** starts its

US 9,560,719 B2

9

program codes firstly by executing a subroutine of free-run in which PWM signal is generated with the conduction time period T_{on} periodically varying within a preset range of 0 to 50% duty for a fixed time period, such that the LEDs 250 generate illumination with light intensity level gradually and periodically increasing from zero to 50% of the maximum light intensity and then decreasing from 50% to zero to complete a variation cycle. This periodical variation of the low illumination level can last freely for two or three cycles within the fixed time period which is preferable to be one minute. However, it is not to limit the present invention in this manner. Within the one-minute fixed time period, for instance, the free-run of periodical illumination variation may be overridden by the user by turning off a power switch momentarily (for 1-2 seconds) and then switching it back on. At the moment when the power switch is turned off and then switched back on, the microcontroller 240 detects this OFF-ON event through a power supply detection circuit 270b and leaves the subroutine to terminate free-run, and simultaneously stores the T_{on} value of PWM signal related to the time point of the OFF-ON event to update a data base for generating the first level illumination in the PS mode. In general, the user can follow the gradual and periodical free-run of the low level lighting variation and select a favorable light intensity level by promptly turning the power switch off and again on (short power interruption). After overriding by power interruption, the microcontroller 240 jumps out of the subroutine of free-run and continues its program codes to execute the PS mode in which the illumination level is determined by the user. The free-run of periodical lighting variation may end automatically when the fixed time period expires with power interruption not being detected; the microcontroller 240 jumps out of the subroutine of free-run and acquires from its memory a preset or earlier T_{on} value of PWM signal for generating the first level illumination in the PS mode. Refer to FIG. 2C again, an energy storage capacitor 270c is connected between the high end and the ground of the working voltage V_{DD} . This capacitor 270c is for holding the voltage V_{DD} to keep the circuits 240, 270b still working when electric power is interrupted for 1-2 seconds. Therefore, when overriding free-run by short power interruption, an instant zero voltage is detected by the power supply detection circuit 270b and recognized by the microcontroller 240 to perform function for selecting and setting a desired illumination level.

In another embodiment, refer to FIG. 1 again, when an ambient light detected by the photo sensor unit 120 is lower than a predetermined value, the light emitting unit 150 may be turned on thereby by the loading and power control unit 140 to generate an adjustable level illumination for a first predetermined duration and then turned off or switched to a low level illumination, when an intrusion is detected by the motion sensor unit 130, the light emitting unit 150 is turned on by the loading and power control unit 140 to generate a high level illumination for a second predetermined duration and then turned off or switched to a low level illumination until the next intrusion detection; when an ambient light detected by the photo sensor unit 120 is higher than the predetermined value, the light emitting unit 150 is turned off by the loading and power control unit. The time setting unit 160 is used to set the first and the second predetermined duration respectively for the adjustable level illumination and the high level illumination. The external control unit 170 is used in two setting modes for setting illumination characteristics of the adjustable level illumination; wherein the first setting mode is a manual setting, in which the illumination level of the light emitting unit is set in a preset range

10

by activating the external control unit; 170 wherein the second setting mode is a free-running setting, in which the light emitting unit performs a free-run of the adjustable level illumination with light intensity gradually and periodically increasing and then decreasing in a preset range to complete a cycle, wherein the free-run may be terminated by activation of the external control unit 170 at a time point corresponding to a specific light intensity level, such that the light emitting unit performs the adjustable level illumination constantly with the specific light intensity level being set thereof.

In still another embodiment, a lighting management device is provided. Refer to FIG. 1 again, the lighting management device applicable to a lighting load such as the light emitting unit 150. The lighting management device comprises the loading and power control unit 140, the power supply unit 110 and the external control unit 170 coupled with the loading and power control unit. The loading and power control unit 140 comprises a microcontroller (such as the microcontroller 240 shown in FIG. 2A) electrically coupled with a semiconductor switching device (such as the transistor Q1 shown in FIG. 2A). The external control unit 170 may be a push button, a touch panel, an infrared ray sensor or a remote control device coupled or wirelessly linked to a pin of the microcontroller. The semiconductor switching device is electrically connected in series with the power supply unit and the lighting load, such as the transistor Q1 is electrically connected in series with the DC source and the light emitting unit 250, wherein the microcontroller with written program code controls the conduction rate of the semiconductor switching device, wherein the external control unit 170 enables a user to select a desired illumination characteristic during a free running setting process performed by the lighting load, wherein the lighting load operates a free-run of illumination level by gradually and periodically changing the illumination characteristic, wherein the free-run may be terminated by activation of the external control unit 170 at a time point corresponding to a specific illumination characteristic selected by the user, wherein the microcontroller accordingly interprets the conduction rate of the semiconductor switching device at the time point when the external control unit 170 is activated and the free running is terminated to be the illumination characteristic set for illumination performance, the illumination characteristic is then memorized by the microcontroller for repetitive performance. Further, in one embodiment, the free run setting is terminated and the illumination characteristic of the lighting load is set by turning off a power switch instantly and turning it back on at the time point the lighting load performs a desired lighting characteristic selected by the user.

According to the previous embodiment, a free running setting method with activation of external control unit or through power switch interruption is provided. Refer to FIG. 2D, the method comprises step S110: selecting a desired illumination characteristic during a free running setting process performed by the lighting load by an the external control unit; S120: utilizing the lighting load to operate a free-run of illumination level by gradually and periodically changing the illumination characteristic; and S130: terminating the free-run by activating of the external control unit or through power switch interruption at a time point corresponding to a specific illumination characteristic selected by the user, wherein the microcontroller accordingly interprets the conduction rate of the semiconductor switching device at the time point when the external control unit is activated or a power switch interruption is detected and the free running

US 9,560,719 B2

11

is terminated to be the illumination characteristic set for illumination performance, the illumination characteristic is then memorized by the microcontroller for repetitive performance.

In summary, in a preferred embodiment of the present disclosure, a two-level LED security light may employ an external control unit coupled to a loading and power control unit for adjusting or setting the illumination level of the LED light. The external control unit may be a push button, a voltage divider, a touch panel, an infrared ray sensor or other devices for generating control signals having different attributes depending on the category of the external control unit. For instance, a push button generates a binary signal having a zero voltage lasting for a time length equal to the time duration while the push button being pushed down; quite different, a voltage divider generates a DC voltage tuned by rotating a rotary knob attached to the voltage divider. The loading and power control unit may be implemented by a microcontroller with program codes designed respectively accommodating to different control signals of different attributes for generating PWM signal with T_{on} value variable according to the control signal attribute, such as to carry out illumination level adjustment or setting. The illumination level characteristics including light intensity and color temperature can be thus set by operating the external control unit.

(Second Exemplary Embodiment)

Refer back to FIG. 1, wherein the light emitting unit 150 may include a phase controller and one or more parallel-connected alternating current (AC) LEDs. The phase controller is coupled between the described one or more parallel-connected ACLEDs and AC power source. The loading and power controller 140 in the instant exemplary embodiment may through the phase controller adjust the average power of the light emitting unit 150 so as to generate variations in the first level and the second level illuminations. Refer to FIG. 3A and FIG. 4 in conjunction with FIG. 1, this embodiment provides a two-level security light control device applicable to AC lighting sources, comprising the power supply unit 110, the photo sensor unit 120 (that is the photo sensor 220), the motion sensor unit 130 (that is the motion sensor 230), the loading and power control unit 140 (that is the microcontroller 240), a zero-crossing detection circuit 453, a plurality of phase controllers (one phase controller 452 shown in FIG. 3A and one phase controllers 551 shown in FIG. 4 are exemplary illustrated), the time setting unit 160 (that is the variable 260') and the external control unit 270' coupled with the loading and power control unit 240.

Refer to FIG. 3A, which illustrates a schematic diagram of a two-level LED security light 100 in accordance to the second exemplary embodiment of the present disclosure. The operation of the external control 270' can be referred to FIG. 2C and the related description of manual and free-running setting of illumination level, and the earlier description thus the redundant information is not repeated. It is worth mentioning that the power supply detection circuit 270b is implemented by the zero-crossing detection circuit 453, and the power switch mentioned in the previous embodiment can be implemented by the power switch 160a electrically coupled to the AC power source and the zero-crossing detection circuit 453. For a two-level LED security light setting up at the ceiling or a high site far from the user, the free-run setting of the illumination level through instant power interruption by utilizing the power switch 160a is very convenient for the user, in which no any added switching device is needed. The main difference between FIG. 3A

12

and FIG. 2C is in that the light-source load is an ACLED, which is coupled to the AC power source, and further the light emitting unit 450 includes a phase controller 451, for ease of explanation, but the present disclosure is not so restricted. The phase controller 451 is in-series connected to the AC lighting source (ACLED) and the AC power source, wherein the microcontroller 240 is for writing operation program to control a conduction period of the phase controller 451 thereby to adjust the average power of the AC lighting source (ACLED). In another embodiment, a plurality of phase controller 451 can be also controlled by the microcontroller 240. The phase controller 451 includes a bi-directional switching device 452, here, a triac, a zero-crossing detection circuit 453, and a resistor R. The microcontroller 240 turns off the light emitting unit 450 when the photo sensor 220 detects that the ambient light is higher than a predetermined value. Conversely, when the photo sensor 220 detects that the ambient light is lower than the predetermined value, the microcontroller 240 activates the PC mode by turning on the light emitting unit 450. In the PC mode, the microcontroller 240 may select a control pin for outputting a pulse signal which through a resistor R triggers the triac 452 to have a large conduction angle. The large conduction angle configures the light emitting unit 450 to generate a high level illumination for a predetermined duration. Then the microcontroller 240 outputs the pulse signal for PS mode through the same control pin to trigger the triac 452 to have a small conduction angle for switching the light emitting unit 450 from the high level illumination to the low level illumination of the PS mode. Moreover, when the motion sensor 230 (also called motion sensor unit) detects a human motion in the PS mode, the microcontroller 240 temporarily outputs the PC-mode pulse signal through the same control pin to have the light emitting unit 450 generated the high level illumination for a short predetermined duration. After the short predetermined duration, the light emitting unit 450 returns to the low level illumination.

In the illumination control of the ACLED, the microcontroller 240 may utilize the detected zero-crossing time (e.g., the zero-crossing time of an AC voltage waveform) outputted from the zero-crossing detection circuit 453 to send an AC synchronized pulse signal thereof which may trigger the triac 452 of the phase controller 451 thereby to change the average power input to the light emitting unit 450. As the ACLED has a cut-in voltage V_i for start conducting, thus if the pulse signal inaccurately in time triggers the conduction of the triac 452, then the instantaneous value of AC voltage may be lower than the cut-in voltage V_i of ACLED at the trigger pulse. Consequently, the ACLED may result in the phenomenon of either flashing or not turning on. Therefore, the pulse signal generated by the microcontroller 240 must fall in a proper time gap behind the zero-crossing point associated with the AC sinusoidal voltage waveform.

Supposing an AC power source having a voltage amplitude V_m and frequency f , then the zero-crossing time gap t_D of the trigger pulse outputted by the microcontroller 240 should be limited according to $t_0 < t_D < 1/2f - t_0$ for a light-source load with a cut-in voltage V_i , wherein $t_0 = (1/2\pi f) \sin^{-1}(V_i/V_m)$. The described criterion is applicable to all types of ACLEDs to assure that the triac 452 can be stably triggered in both positive and negative half cycle of the AC power source. Take ACLED with V_i (rms)=80V as an example, and supposing the V_m (rms)=110V and $f=60$ Hz, then $t_0=2.2$ ms and $(1/2f)=8.3$ ms may be obtained. Consequently, the proper zero-crossing time gap t_D associated with the phase modulation pulse outputted by the microcontroller

US 9,560,719 B2

13

240 which lagged the AC sinusoidal voltage waveform should be designed in the range of $2.2\text{ ms} < t_D < 6.1\text{ ms}$.

Refer to FIG. 3B, which illustrates a timing waveform of the two-level LED security light in accordance to the second exemplary embodiment of the present disclosure. Waveforms (a)~(d) of FIG. 3B respectively represent the AC power source, the output of the zero-crossing detection circuit 453, the zero-crossing delay pulse at the control pin of the microcontroller 240, and the voltage waveform across the two ends of the ACLED in the light emitting unit 450. The zero-crossing detection circuit 453 converts the AC voltage sinusoidal waveform associated with the AC power source to a symmetric square waveform having a low and a high voltage levels as shown in FIG. 3B(b). At the zero-crossing point of the AC voltage sinusoidal wave, the symmetric square waveform may transit either from the low voltage level to the high voltage level or from the high voltage level to the low voltage level. Or equivalently, the edge of the symmetric square waveform in the time domain corresponds to the zero-crossing point of the AC voltage sinusoidal waveform. As shown in FIG. 3B(c), the microcontroller 240 outputs a zero-crossing delay pulse in correspondence to the zero-crossing point of the AC sinusoidal waveform in accordance to the output waveform of the zero-crossing detection circuit 453. The zero-crossing delay pulse is relative to an edge of symmetric square waveform behind a time gap t_D in the time domain. The t_D should fall in a valid range, as described previously, to assure that the triac 452 can be stably triggered thereby to turn on the ACLED. FIG. 3B(d) illustrates a voltage waveform applied across the two ends associated with the ACLED. The illumination level of the light emitting unit 450 is related to the conduction period t_{on} of the ACLED, or equivalently, the length t_{on} is directly proportional to the average power inputted to the ACLED. The difference between the PC mode and the PS mode being that in the PC mode, the ACLED has longer conduction period, thereby generates the high level illumination; whereas in the PS mode, the ACLED conduction period is shorter, hence generates the low level illumination.

Refer to FIG. 3A and FIG. 3B concurrently for setting ACLED illumination level. In manual setting, the microcontroller 240 with program codes controls the conduction time period t_{on} of the ACLED to be in a preset range $0 < t_{on} < 1/4f - t_0$; wherein by tuning the variable resistor (voltage divider 270a) the light intensity level of the ACLED can be adjusted between zero and 50% of the maximum light intensity. In the free-run setting of illumination level, the microcontroller 240 with program codes controls the conduction time period t_{on} of the ACLED to periodically change in a preset range $0 < t_{on} < 1/4f - t_0$, such that the ACLED generates illumination gradually and periodically increasing from zero to 50% and then decreasing from 50% to zero of the maximum light intensity. When following the free-run of lighting variation, the illumination level can be set through power interruption momentarily by utilizing the power switch 160a.

Refer to FIG. 4, which illustrates a schematic diagram of a two-level LED security light 100 in accordance to the second exemplary embodiment of the present disclosure. The operation of the external control 270' can be referred to FIG. 2C and the related description of manual and free-running setting of illumination level, and the earlier description thus the redundant information is not repeated. It is worth mentioning that the power supply detection circuit 270b is implemented by the zero-crossing detection circuit 554, and the power switch mentioned in the previous

14

embodiment can be implemented by the power switch 160a electrically coupled to the AC power source and the zero-crossing detection circuit 554. The light emitting unit 550 of the lighting apparatus 100 includes an ACLED1, an ACLED2, and a phase controller 551. The phase controller 551 can be treated as two phase controllers 451 (shown in FIG. 3A) which are parallel-connected. In still another embodiment, a plurality of phase controllers (451 or 551) are respectively series-connected to a plurality of alternating current (AC) lighting sources (ACLED), wherein the pairs of phase controller-AC lighting source are parallel-connected to the AC power source. The phase controller 551 includes triacs 552 and 553, the zero-crossing detection circuit 554 as well as resistors R1 and R2. The light emitting unit 550 of FIG. 4 is different from the light emitting unit 450 of FIG. 3A in that the light emitting unit 550 has more than one ACLEDs and more than one bi-directional switching devices. Furthermore, the color temperatures of the ACLED1 and the ACLED2 may be selected to be different.

In the exemplary embodiment of FIG. 4, the ACLED1 has a high color temperature, and the ACLED2 has a low color temperature. In the PC mode, the microcontroller 240 uses the phase controller 551 to trigger both ACLED1 and ACLED2 to conduct for a long period, thereby to generate the second level illumination as well as illumination of mix color temperature. In the PS mode, the microcontroller 240 uses the phase controller 551 to trigger only the ACLED2 to conduct for a short period, thereby generates the first level illumination as well as illumination of low color temperature. Moreover, in the PS mode, when the motion sensor 230 detects a human motion, the microcontroller 240 may through the phase controller 551 trigger the ACLED1 and the ACLED2 to conduct for a long period. Thereby, it may render the light emitting unit 450 to generate the second level illumination of high color temperature and to produce high contrast in illumination and hue, for a short predetermined duration to warn the intruder. Consequently, the lighting apparatus may generate the first level or the second level illumination of different hue. The rest of operation theories associated with the light emitting unit 550 are essentially the same as the light emitting unit 450 and further descriptions are therefore omitted.

A lighting apparatus may be implemented by integrating a plurality of LEDs with a microcontroller and various types of sensor components in the controlling circuit in accordance to the above described two exemplary embodiments. This lighting apparatus may automatically generate first level illumination when the ambient light detected is insufficient and time-switch to the low level illumination. In addition, when a person is entering the predetermined detection zone, the lighting apparatus may switch from the first level illumination to the second level illumination, to provide the person with sufficient illumination or to generate strong illumination and hue contrast for monitoring the intruder. Further, the illumination characteristic of at least one of the first level illumination and the second level illumination of the light emitting unit can be set through two setting modes, namely, manual and free-running setting, such that the illumination characteristic is set to fulfill user's demand by activating an external control unit.

The above-mentioned descriptions represent merely the exemplary embodiment of the present disclosure, without any intention to limit the scope of the present disclosure thereto. Various equivalent changes, alternations or modifications based on the claims of present disclosure are all consequently viewed as being embraced by the scope of the present disclosure.

US 9,560,719 B2

15

What is claimed is:

1. An LED security light, comprising:

a light emitting unit;

a loading and power control unit;

a photo sensor unit;

a motion sensor unit;

a power supply unit; and

an external control unit, electrically coupled with the loading and power control unit;

wherein the light emitting unit is an LED lamp;

wherein the loading and power control unit comprises a microcontroller electrically coupled with a controllable semiconductor switching device, wherein the controllable semiconductor switching device is electrically connected in series with a power source and with the light emitting unit, wherein the microcontroller outputs a control signal to control conduction rate of the controllable semiconductor switching device for delivering different average electric powers to drive the light emitting unit for generating different illumination modes according to control signals received from the photo sensor unit and the motion sensor unit, wherein when an ambient light detected by the photo sensor unit is lower than a first predetermined value, the motion sensor unit is switched on and the light emitting unit is simultaneously managed by the loading and power control unit to perform a first level illumination mode, wherein when the ambient light detected by the photo sensor unit is higher than a second predetermined value, the light emitting unit and the motion sensor unit are turned off by the loading and power control unit, wherein when a motion intrusion is detected by the motion sensor unit, the loading and power control unit manages to increase the average electric power delivered to the light emitting unit to perform a second level illumination mode for a predetermined duration, and then the light emitting unit is resumed to perform the first level illumination mode, wherein the first level illumination mode and the second level illumination mode are respectively characterized with specific light intensity, wherein the light intensity of the second level illumination mode is always higher than the light intensity of the first level illumination mode, wherein the external control unit is at least usable for adjusting and setting the light intensity of at least one illumination mode.

2. The LED security light according to claim 1, wherein the illumination mode is the first level illumination mode, wherein the external control unit is used for adjusting and setting the light intensity of the first level illumination mode.

3. The LED security light according to claim 1, wherein the illumination mode is the second level illumination mode, wherein the external control unit is used for adjusting and setting the light intensity of the second level illumination mode.

4. The LED security light according to claim 1, wherein the external control unit is further usable for adjusting and setting a time length of the predetermined duration for performing the second level illumination mode.

5. The LED security light according to claim 1, wherein the external control unit comprises at least a push button, a touch panel, an infrared ray sensor or a wireless remote control device electrically coupled to at least a pin of the microcontroller of the loading and power control unit; wherein when the push button, the touch panel, the infrared ray sensor or the wireless remote control device is operated, a voltage signal readable and interpretable to the microcon-

16

troller is thereby generated to trigger the microcontroller to activate a corresponding subroutine designed for adjusting and setting the light intensity of at least one of the first level illumination mode or the second level illumination mode.

6. The LED security light according to claim 5, wherein the wireless remote control device is a Wi-Fi wireless control signal receiver, a Blue Tooth wireless control signal receiver or a RF (radio frequency) wireless control signal receiver.

7. The LED security light according to claim 6, wherein the first level illumination mode can be preset at zero.

8. The LED security light according to claim 1, wherein the external control unit is a push button, a touch panel, an infrared ray sensor or a wireless remote control device; wherein when the push button, the touch panel, the infrared ray sensor or the wireless remote control device is activated, at least one of a first voltage signal with a binary format or a second voltage signal with a binary format readable and interpretable to the microcontroller is generated to trigger the microcontroller to activate at least one of a first subroutine or a second subroutine, wherein the first subroutine is designed for adjusting and setting the light intensity of the first level illumination mode or the second level illumination mode, wherein the second subroutine is designed for adjusting and setting a time length of the predetermined duration for performing the second level illumination mode.

9. The LED security light according to claim 8, wherein the wireless remote control device is a Wi-Fi wireless control signal receiver, a Blue Tooth wireless control signal receiver or a RF (radio frequency) wireless control signal receiver.

10. The LED security light according to claim 9, wherein the light intensity of the first level illumination mode can be preset at zero.

11. The LED security light according to claim 9, wherein the microcontroller comprises a memory for saving or installing an application program (APP) or a software program, wherein the application program (APP) from an internet or a cloud server is downloaded for updating the memory of the microcontroller.

12. The LED security light according to claim 1, wherein the external control unit comprises at least one voltage divider; wherein the voltage divider comprises a variable resistor, wherein the voltage divider is electrically connected to a pin of the microcontroller, wherein when the voltage divider is operated, a DC voltage is selected and generated by tuning the variable resistor to trigger the microcontroller to activate a corresponding subroutine designed for adjusting and setting the light intensity of at least one of the first level illumination mode or the second level illumination mode.

13. The LED security light according to claim 1, wherein the power supply unit is an AC/DC power converter to convert an AC power source into DC power required for operating the LED security light, wherein the power source is a DC power from the power supply unit; wherein the controllable semiconductor switching device is a unidirectional semiconductor switching device, wherein the microcontroller outputs a PWM (pulse width modulation) signal to control a conduction period (T_{on}) and a cutoff period (T_{off}) of the controllable semiconductor switching device for delivering different average currents from the power supply unit to drive the light emitting unit for generating different illumination modes, wherein the microcontroller controls the controllable semiconductor switching device respectively to have a short conduction period (T_{on}) and a long conduction period (T_{off}) such that the light emitting unit

US 9,560,719 B2

17

respectively generated a first level illumination mode and a second level illumination mode characterized by different light intensity according to the signals received from the photo sensor unit and the motion sensor unit.

14. The LED security light according to claim 1, wherein the power supply unit is a battery module to output DC power for operating the LED security light, wherein the power source is a DC power, wherein the controllable semiconductor switching device is a unidirectional semiconductor switching device, wherein the microcontroller outputs a PWM (pulse width modulation) signal to control a conduction period (T_{on}) and a cutoff period (T_{off}) of the controllable semiconductor switching device for delivering different average electric currents from the power supply unit to drive the light emitting unit for generating different illumination modes, wherein the microcontroller controls the unidirectional semiconductor switching device respectively to have a short conduction period (T_{on}) and a long conduction period (T_{on}) such that the light emitting unit respectively generate a first level illumination mode and a second level illumination mode characterized by different light intensity according to signals received from the photo sensor unit and the motion sensor unit.

15. The LED security light according to claim 14, wherein the battery module is a solar battery module comprising a solar panel circuitry for charging the solar battery.

16. The LED security light according to claim 1, wherein the power supply unit is an AC/DC power converter to convert an AC power source into DC power for operating the LED security light, wherein the power source is the AC power source, wherein the light emitting unit is a LED lamp adaptable to the AC power source, wherein the controllable semiconductor switching device is a phase controller comprising a bidirectional semiconductor switching device, wherein a zero-crossing detection circuit is electrically coupled to the microcontroller, wherein the bidirectional semiconductor switching device is connected in series between the AC power source and the LED lamp, wherein the microcontroller incorporating with the zero-crossing detection circuit outputs a time delay pulse lagging behind the zero-crossing point in each half cycle of the AC power source to control the conduction rate of the phase controller for delivering different average AC power to drive the LED lamp for generating different illumination modes according to control signals received from the photo sensor unit and the motion sensor unit.

17. The LED security light according to claim 16, wherein the LED lamp is a DC LED module bridging one port to a full wave rectifier to receive AC power delivered by the power supply unit controlled by the loading and power control unit.

18. The LED security light according to claim 16, wherein the LED lamp is an AC LED module comprising two polarity reverse LED arrays connected in parallel, wherein the first LED array conducts a positive half cycle of the AC power controlled by the loading and power control unit while the second LED array conducts a negative half cycle of the AC power controlled by the loading and power control unit.

19. The LED security light according to claim 16, wherein in order to ensure a successful conduction, the phase controller is confined to operate in a dimmable phase time domain between t_0 and $1/(2f)-t_0$, wherein f is the frequency of the AC power source and t_0 is a corresponding phase time of a cut-in voltage at which the LED lamp starts to emit light.

18

20. An LED security light, comprising:

- a light emitting unit;
- a loading and power control unit;
- a photo sensor unit;
- a motion sensor unit;
- a power supply unit; and
- an external control unit, electrically coupled with the loading and power control unit;

wherein the light emitting unit is an LED lamp, wherein the loading and power control unit comprises a microcontroller, wherein the microcontroller is electrically coupled to a controllable semiconductor switching device, wherein the controllable semiconductor switching device is electrically connected in series with a power source and with the light emitting unit, wherein the microcontroller outputs a control signal to control conduction rate of the controllable semiconductor switching device for delivering different average electric powers to drive the light emitting unit for generating different illumination modes according to control signals received from the photo sensor unit or motion sensor unit;

wherein when an ambient light detected by the photo sensor unit is lower than a first predetermined value, the light emitting unit is thereby turned on by the loading and power control unit to perform a first level illumination mode for a first predetermined duration, then the light emitting unit is switched to perform a second level illumination mode, wherein when the ambient light detected by the photo sensor unit is higher than a second predetermined value, the light emitting unit is thereby turned off by the loading and power control unit, wherein when a motion intrusion is detected by the motion sensor unit, the loading and power control unit manages to increase the average electric power delivered to the light emitting unit to generate a high level illumination mode for a second predetermined duration, wherein the first level illumination mode, the second level illumination mode and the high level illumination mode are respectively characterized with specific light intensity, wherein the light intensity of the high level illumination mode is always higher than the light intensity of the second level illumination mode; wherein the external control unit is at least usable for adjusting and setting the light intensity for at least one of the first level illumination mode, the second level illumination mode or the high level illumination mode.

21. The LED security light according to claim 20, wherein the external control unit is further usable for adjusting and setting a time length of the first predetermined duration for performing the first level illumination mode.

22. The LED security light according to claim 20, wherein the external control unit is further usable for adjusting and setting a time length of the second predetermined duration for performing the high level illumination mode.

23. The LED security light according to claim 20, wherein the external control unit is further usable for alternately performing between a motion sensor controlled illumination mode and an adjustable timer controlled illumination mode, wherein when the LED security light is in the adjustable timer controlled illumination mode, the motion sensor unit is disabled temporarily till at the time when a time period preset by the adjustable timer expires or till at a clock time point selected by the adjustable timer and the motion sensor unit is then enabled; the external control unit is further usable for adjusting and setting the light intensity of the adjustable timer controlled illumination mode, the external

US 9,560,719 B2

19

control unit is additionally usable for adjusting and setting a time length or the clock time point for performing the adjustable timer controlled illumination mode; wherein when the LED security light is in the motion sensor controlled illumination mode, the external control unit is further usable for adjusting and setting the light intensity of at least one of the first level illumination mode, the second level illumination mode and the high level illumination mode, the external control unit is also usable for adjusting and setting the time length of at least one of the first predetermined duration for performing the first level illumination mode or the second predetermined duration for performing the high level illumination mode.

24. The LED security light according to claim 20, wherein the external control unit is at least a push button, a touch panel, an infrared ray sensor, or a wireless remote control device coupled to at least one pin of the microcontroller of the loading and power control unit; wherein when the push button, the touch panel, the infrared ray sensor or a wireless remote control device is operated, a voltage signal readable and interpretable to the microcontroller is thereby generated to trigger the microcontroller to activate a first corresponding subroutine designed for adjusting and setting the light intensity of at least one of the first level illumination mode, the second level illumination mode or the high level illumination mode; or the microcontroller to activate a second corresponding subroutine designed for adjusting and setting a time length of at least one of the first predetermined duration for performing the first level illumination mode or the second predetermined duration for performing the high level illumination mode.

25. The LED security light according to claim 24, wherein the wireless remote control device is a Wi-Fi wireless control signal receiver, a Blue Tooth wireless control signal receiver or a RF (radio frequency) wireless control signal receiver.

26. The LED security light according to claim 25, wherein the light intensity of the second level illumination mode can be preset at zero.

27. The LED security light according to claim 25, wherein the microcontroller comprises a memory for saving or installing an application (APP) or a software program, wherein the application program or software program from an internet or a cloud server is downloaded to update the memory.

28. The LED security light according to claim 20, wherein the external control unit comprises at least one voltage divider, wherein the voltage divider comprises a variable resistor, wherein the voltage divider is electrically connected to a pin of the microcontroller, wherein when the voltage divider is operated, a DC voltage is selected and generated by tuning the variable resistor to trigger the microcontroller to activate a corresponding subroutine designed for adjusting and setting a time length of at least one of the first predetermined duration or the second predetermined duration.

29. The LED security light according to claim 28, wherein the light intensity of the second level illumination mode can be preset at zero.

30. The LED security light according to claim 20, wherein the external control unit comprises a power supply detecting circuit connectable to a power switch and at least two voltage dividers; wherein the power switch is a rocker switch connected to an AC power source to control power on and power off; wherein when instantly turning the power switch off and turning the power switch back on in a short preset time interval, the electric power interruption is

20

detected by the microcontroller through the power supply detecting circuit, the microcontroller thereby manages to switch alternately between performing a motion sensor controlled illumination mode and performing a photo sensor controlled dusk to dawn illumination mode; wherein the first voltage divider is a dimmer circuitry comprising a first variable resistor, wherein the second voltage divider is a time setting unit comprising a second variable resistor, wherein the first voltage divider is electrically connected to one pin of the microcontroller, wherein the second voltage divider is electrically connected to another pin of the microcontroller, wherein when the first voltage divider is operated, a first DC voltage is selected and generated by tuning the first variable resistor to trigger the microcontroller to activate a first corresponding subroutine designed for setting the light intensity for at least one of the first level illumination mode, the second level illumination mode and the high level illumination mode; wherein when the second voltage divider is operated, a second DC voltage is selected and generated by tuning the second variable resistor to trigger the microcontroller to activate a second corresponding subroutine for setting a time length of at least the first predetermined duration for performing the first level illumination mode or the second predetermined duration for performing the high level illumination mode.

31. The LED security light according to claim 30, wherein the light intensity of the second level illumination mode can be preset at zero.

32. The LED security light according to claim 20, wherein the power supply unit is an AC/DC power converter to convert an AC power source into DC power required for operating the LED security light, wherein the power source is an AC power source, wherein the light emitting unit is an LED lamp adaptable to the AC power source, wherein the controllable semiconductor switching device is a phase controller comprising a bidirectional semiconductor switching device, wherein a zero-crossing detection circuit is electrically coupled to the microcontroller, wherein the phase controller is connected in series between the AC power source and the LED lamp, wherein the microcontroller incorporating with the zero-crossing detection circuit outputs a time delay pulse lagging behind the zero-crossing point in each half cycle of the AC power source to control the conduction rate of the phase controller for delivering different average AC power to drive the LED lamp for generating different illumination modes according to the control signals received from the photo sensor unit and the motion sensor unit.

33. The LED security light according to claim 32, wherein the LED lamp is a DC LED module bridging one port to a full wave rectifier to receive AC power delivered by the power supply unit controlled by the loading and power control unit.

34. The LED security light according to claim 32, wherein the LED lamp is an AC LED module comprising two polarity reverse LED arrays connected in parallel, wherein the first LED array conducts a positive half cycle of the AC power controlled by the loading and power control unit while the second LED array conducts a negative half cycle of the AC power controlled by the loading and power control unit.

35. The LED security light according to claim 32, wherein in order to ensure a successful conduction, the phase controller is confined to operate in a dimmable phase time domain between t_0 and $1/(2f)-t_0$, wherein f is the frequency

US 9,560,719 B2

21

of AC power source and t_0 is a corresponding phase time of a cut-in voltage at which the LED lamp starts to emitting light.

36. The LED security light according to claim 20, wherein the power supply unit is an AC/DC power converter to convert an AC power source into DC power power required for operating the LED security light, wherein the power source is a DC power from the power supply unit; wherein the controllable semiconductor switching device is a unidirectional semiconductor switching device, wherein the microcontroller outputs a PWM (pulse width modulation) signal to control a conduction period (T_{on}) and a cutoff period (T_{off}) of the controllable semiconductor switching device for delivering different average currents from the power supply unit to drive the light emitting unit for generating different illumination modes characterized by different light intensity according to the signals received from the photo sensor unit and the motion sensor unit.

37. The LED security light according to claim 20, wherein the power supply unit is a battery module to output DC power for operating the LED security light, wherein the power source is a DC power, wherein the controllable semiconductor switching device is a unidirectional semiconductor switching device, wherein the microcontroller outputs a PWM (pulse width modulation) signal to control a conduction period (T_{on}) and a cutoff period (T_{off}) of the controllable semiconductor switching device for delivering different average electric currents from the power supply unit to drive the light emitting unit for generating different illumination modes characterized by different light intensity according to signals received from the photo sensor unit and the motion sensor unit.

38. The LED security light according to claim 37, wherein the battery module is a solar battery module comprising a solar panel circuitry for charging the solar battery.

39. An LED security light control device, comprising:

a loading and power control unit;

a photo sensor unit;

a power supply unit; and

an external control unit, electrically coupled with the loading and power control unit;

wherein the LED security light control device is connectable to an LED lamp, wherein the loading and power control unit comprises a microcontroller, wherein the microcontroller is electrically coupled to a controllable semiconductor switching device, wherein the controllable semiconductor switching device is electrically connectable in series with a power source and with the LED lamp, wherein the microcontroller outputs a control signal to control conduction rate of the controllable semiconductor switching device for delivering different average electric power to drive the LED lamp for generating different illumination modes according to control signals received from the photo sensor unit;

wherein when an ambient light detected by the photo sensor unit is lower than a first predetermined value, the LED lamp is thereby turned on by the loading and power control unit to generate a first level illumination mode for a first predetermined duration, then the LED lamp is switched to a second level illumination mode, wherein when the ambient light detected by the photo sensor unit is higher than a second predetermined value, the LED lamp is thereby turned off by the loading and power control unit;

wherein the external control unit is at least usable for adjusting and setting a light intensity for at least the second level illumination mode.

22

40. The LED security light control device according to claim 39, wherein the external control unit is further usable for adjusting and setting a time length of at least the first predetermined duration for performing the first level illumination mode.

41. The LED security light control device according to claim 39, wherein the external control unit comprises at least a push button, a touch panel, an infrared ray sensor or a wireless remote control device electrically coupled to a pin of the microcontroller, wherein when the push button, the touch panel, the infrared ray sensor or the wireless remote control device is operated, a voltage signal readable and interpretable to the microcontroller is thereby generated to trigger the microcontroller to activate a corresponding subroutine; wherein the corresponding subroutine is designed for adjusting and setting at least the light intensity of the second level illumination mode, or for adjusting and setting a time length of at least the first predetermined duration for performing the first level illumination mode.

42. The LED security light control device according to claim 41, wherein the wireless remote control device is a Wi-Fi wireless control signal receiver, a Blue Tooth wireless control signal receiver or a RF (radio frequency) wireless control signal receiver.

43. The LED security light control device according to claim 42, wherein the microcontroller has a memory for saving or installing an application program (APP) or an application software, wherein the application program or application software from an internet or a cloud server is downloaded to update the memory of the microcontroller.

44. The LED security light control device according to claim 39, wherein the external control unit comprises at least one voltage divider, wherein the voltage divider comprises a variable resistor, wherein the voltage divider is electrically connected to a pin of the microcontroller, wherein when the voltage divider is operated, a DC voltage is selected and generated by tuning the variable resistor to trigger the microcontroller to activate a subroutine designed for setting at least the light intensity of the second level illumination mode or to activate a subroutine designed for adjusting and setting at least a time length of the first predetermined duration for performing the first level illumination mode.

45. The LED security light control device according to claim 39, wherein the power supply unit is an AC/DC power converter to convert an AC power source into DC power for operating the LED security light, wherein the power source is the AC power source, wherein the light emitting unit is an LED lamp adaptable to the AC power source, wherein the controllable semiconductor switching device is a phase controller comprising a bidirectional semiconductor switching device, wherein a zero-crossing detection circuit is electrically coupled to the microcontroller, wherein the bidirectional semiconductor switching device is connected in series between the AC power source and the LED lamp, wherein the microcontroller incorporating with the zero-crossing detection circuit outputs a time delay pulse lagging behind the zero-crossing point in each half cycle of the AC power source to control the conduction rate of the phase controller for delivering different average AC power to drive the LED lamp for generating different illumination modes according to control signals received from the photo sensor unit.

46. The LED security light control device according to claim 45, wherein the LED lamp is a DC LED module bridging one port to a full wave rectifier to receive AC power delivered by the power supply unit controlled by the loading and power control unit.

US 9,560,719 B2

23

47. The LED security light control device according to claim 45, wherein the LED lamp is an AC LED module comprising two polarity reverse LED arrays connected in parallel, wherein the first LED array conducts a positive half cycle of the AC power controlled by the loading and power control unit while the second LED array conducts a negative half cycle of the AC power controlled by the loading and power control unit.

48. The LED security light control device according to 45, wherein in order to ensure a successful conduction, the phase controller is confined to operate in a dimmable phase time domain between t_0 and $1/(2f)-t_0$, wherein f is the frequency of the AC power source and t_0 is a corresponding phase time of a cut-in voltage at which the LED lamp starts to emit light.

49. An LED security light control device, comprising:
a loading and power control unit;
a photo sensor unit;
a motion sensor unit;
a power supply unit; and
an external control unit;

wherein the LED security light control device is electrically connectable to an LED lamp, wherein the loading and power control unit comprises a microcontroller, wherein the microcontroller is electrically coupled to a controllable semiconductor switching device, wherein the controllable semiconductor switching device is electrically connectable in series between a power source and the LED lamp, wherein the microcontroller outputs a control signal to control conduction rate of the controllable semiconductor switching device for delivering different electric powers to drive the LED lamp for generating different illumination modes according to control signals received from the photo sensor unit and the motion sensor unit;

wherein when an ambient light detected by the photo sensor unit is lower than a first predetermined value, the motion sensor unit is switched on and the LED lamp is managed by the loading and power control unit for performing a first level illumination mode for a first predetermined duration, then the LED lamp is switched to a second level illumination mode, wherein when the ambient light detected by the photo sensor unit is higher than a second predetermined value, the motion sensor unit and the LED lamp are thereby switched off by the loading and power control unit, wherein when a motion intrusion is detected by the motion sensor unit, the loading and power control unit manages to increase the average electric power delivered to the LED lamp to generate a high level illumination mode for a second predetermined duration, and then the LED lamp is resumed to the second level illumination mode, wherein the first level illumination mode, the second level illumination mode and the high level illumination mode are characterized with different light intensity wherein the light intensity of the high level illumination mode is higher than the light intensity of the second level illumination mode; wherein the external control unit is at least usable for adjusting and setting at least the light intensity of at least one of the first level illumination mode, the second level illumination mode and the high level illumination mode.

50. The LED security light control device according to claim 49, wherein the external control unit is further usable for adjusting and setting at least a time length of at least the first predetermined duration for performing the first level

24

illumination mode or the second predetermined duration for the high level illumination mode.

51. The LED security light control device according to claim 49, wherein the external control unit comprises at least a push button, a touch panel, an infrared ray sensor or a wireless remote control device electrically coupled to at least a pin of the microcontroller; wherein when the push button, the touch panel, the infrared ray sensor or the wireless remote control device is operated, a first voltage signal readable and interpretable to the microcontroller is selected and generated to trigger the microcontroller to activate a first corresponding subroutine designed for adjusting and setting at least the light intensity of at least one of the first level illumination mode, the second level illumination mode and the high level illumination mode; wherein a second voltage signal readable and interpretable to the microcontroller can be further selected and generated to activate a second corresponding subroutine for adjusting and setting a time length of at least one of the first predetermined duration for performing the first level illumination mode or the second predetermined duration for performing the high level illumination mode.

52. The LED security light control device according to claim 51, wherein the wireless remote control device is a Wi-Fi wireless control signal receiver, a Blue Tooth wireless control signal receiver or a RF (radio frequency) wireless control signal receiver.

53. The LED security light control device according to claim 51, wherein the light intensity of the second level illumination mode can be preset at zero.

54. The LED security light control device according to claim 52, wherein the microcontroller has a memory for saving or installing an application program (APP) or application software, wherein the application program (APP) or application software from an internet or cloud server is downloaded to update the memory of the microcontroller.

55. The LED security light control device according to claim 49, wherein the external control unit comprises at least one voltage divider, wherein the voltage divider comprise a variable resistor, wherein the voltage divider is electrically connected to a pin of the microcontroller, wherein when the voltage divider is operated, a DC voltage is selected and generated by tuning the variable resistor to trigger the microcontroller to activate a first corresponding subroutine designed for adjusting and setting the light intensity for at least one of the first level illumination mode, the second level illumination mode or the high level illumination mode; or to activate a second corresponding subroutine designed for adjusting and setting at least a time length of the first predetermined duration for performing the first level illumination mode or the second predetermined duration for performing the high level illumination mode.

56. The LED security light according to claim 55, wherein the light intensity of the second level illumination mode can be preset at zero.

57. The LED security light control device according to claim 49, wherein the power supply unit is an AC/DC power converter to convert an AC power source into DC power for operating the LED security light, wherein the power source is the AC power source, wherein the light emitting unit is an LED lamp adaptable to the AC power source, wherein the controllable semiconductor switching device is a phase controller comprising a bidirectional semiconductor switching device, wherein a zero-crossing detection circuit is electrically coupled to the microcontroller, wherein the bidirectional semiconductor switching device is connected in series between the AC power source and the LED lamp,

US 9,560,719 B2

25

wherein the microcontroller incorporating with the zero-crossing detection circuit outputs a time delay pulse lagging behind the zero-crossing point in each half cycle of the AC power source to control the conduction rate of the phase controller for delivering different average AC power to drive the LED lamp for generating different illumination modes according to control signals received from the photo sensor unit and the motion sensor unit.

58. The LED security light control device according to claim 57, wherein the LED lamp is a DC LED module bridging one port to a full wave rectifier to receive AC power delivered by the power supply unit controlled by the loading and power control unit.

59. The LED security light control device according to claim 57, wherein the LED lamp is an AC LED module comprising two polarity reverse LED arrays connected in parallel, wherein the first LED array conducts a positive half cycle of the AC power controlled by the loading and power

26

control unit while the second LED array conducts a negative half cycle of the AC power controlled by the loading and power control unit.

60. The LED security light control device according to claim 57, wherein in order to ensure a successful conduction, the phase controller is confined to operate in a dimmable phase time domain between t_0 and $1/(2f)-t_0$, wherein f is the frequency of the AC power source and t_0 is a corresponding phase time of a cut-in voltage at which the LED lamp starts to emit light.

61. The LED security light control device according to claim 49, wherein the power supply unit is a battery module to output DC power to operate the LED security light control device, wherein the power source is DC power from the battery module.

62. The LED security light control device according to claim 61, wherein the battery module is a solar battery module comprising a solar panel and a circuitry for charging the solar battery.

* * * * *

EXHIBIT L

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Exclusive

Defiant

180° White Motion Activated Outdoor Integrated LED Twin Head Flood Light with Adjustable Color Temperature

★★★★★ (340) [Write a Review](#) [Questions & Answers \(43\)](#)

- Hardwired Floodlight featuring wall or eave-mount installation
- 180-degree motion detection with up to 70 ft. range
- Integrated LED with 2350 lumen output and 31.64 watt equivalence

\$89⁹⁷

Fixture Color/Finish: **White**



Light Beam Angle: **180**

180

270

Quantity

-

1

+

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Product Overview

Make your home more secure and stylish with this motion activated outdoor flood light. The Adjustable Color Temperature feature lets you adjust the light from Warm White (3,000k) to Day Light (5,000k) to coordinate with your outdoor decorative lighting. The DualBrite feature warns would-be intruders away with its 2350 lumen light output, so you enjoy a safer, more beautiful home.

- Adjustable color temperature feature allows you to adjust the color temperature from warm white (3,000k) to day light (5,000k) with a simple dial control located on the bottom of the motion sensor
- DualBrite 2-level lighting comes pre-set at a warm white (3,000k) temperature, this feature beautifies, protects and saves energy by utilizing accent light from dusk-to-dawn and full light when motion is detected
- Bright LED at 2350 Lumen output
- 180° motion detection with up to 70 ft. range
- Tool-free lamp head and sensor adjustment
- DIY friendly with 3 easy steps to installation
- Eave or wall mount
- Operating temperature range: -25°C (-13°F) to +50°C (+120°F)
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Specifications

Dimensions

Product Depth (in.)

9.54

Product Height (in.)

6.36

Product Length (in.)

9.54

Product Width (in.)

7.13

Details

Actual Color Temperature (K)

5000

Adjustable Detection Sensitivity

Yes

Adjustable Lamp Head

Yes

Color Rendering Index (CRI)

82

Color Temperature

Daylight

Detection Range (ft.)

70

Dusk to Dawn

Yes

Exterior Lighting Product Type

Floodlights



Fixture Color/Finish
White
Fixture Material
Plastic
Glass/Lens Type
Frosted
Included
Hardware Included,Motion Sensor
Light Beam Angle
180
Lumens
2350
Motion Sensing
Yes
Number of Lights
2 Lights
Outdoor Lighting Features
Adjustable Detection Sensitivity,Adjustable Lamp Head,Dusk to Dawn,Motion Sensing,Weather Resistant
Power Options
Hardwired
Power Type
Hardwired
Product Weight (lb.)



1.97lb

Returnable

90-Day

Timer Included

Yes

Voltage

Line Voltage

Watt Equivalence

31.64



Warranty / Certifications

Certifications and Listings

1-UL Listed,ETL Listed,FCC Listed

Manufacturer Warranty

5 Years

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Exclusive

Defiant

180° Bronze Motion Activated Outdoor Integrated LED Twin Head Flood Light with Adjustable Color Temperature

★★★★★ (340) [Write a Review](#) [Questions & Answers \(43\)](#)

- Hardwired Floodlight featuring Wall or Eave-mount Installation
- 180-degree motion detection with up to 70 ft. range
- Integrated LED with 2350 lumen output and 31.64 watt equivalence

\$89⁹⁷

Fixture Color/Finish: **Bronze**



Light Beam Angle: **180**

180

270

Quantity

-

1

+

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Product Overview

The New Defiant Twin Head Adjustable Color Temperature LED motion security light with DualBrite chases away night time darkness with a bright 2350 lumen light output. The Adjustable Color Temperature Feature allows you to adjust the color temperature from Warm White (3,000k) to Day Light (5,000k). This feature allows you to coordinate outdoor Decorative Lighting and Landscape lighting with your new Security Light for a Safe and Beautiful home.

- Adjustable color temperature feature allows you to adjust the color temperature from warm white (3,000k) to day light (5,000k) with a simple dial control located on the bottom of the motion sensor
- DualBrite 2-level light comes pre-set at a warm white (3,000k) temperature and this feature beautifies, protects and saves energy by utilizing accent light from dusk-to-dawn and full light when motion is detected
- Bright LED at 2350 Lumen output
- 180° motion detection with up to 70 ft. range
- Tool-free lamp head and sensor adjustment
- DIY friendly with 3 easy steps to installation
- Wall or eave mount
- Operating temperature range: -25°C (-13°F) to +50°C (+120°F)
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Specifications

Dimensions

Product Depth (in.)

9.54

Product Height (in.)

6.36

Product Length (in.)

9.54

Product Width (in.)

7.13

Details

Actual Color Temperature (K)

5000

Adjustable Detection Sensitivity

Yes

Adjustable Lamp Head

Yes

Color Rendering Index (CRI)

82

Color Temperature

Daylight

Detection Range (ft.)

70

Dusk to Dawn

Yes

Exterior Lighting Product Type

Floodlights

Fixture Color/Finish
Bronze
Fixture Material
Plastic
Glass/Lens Type
Frosted
Included
Hardware Included,Motion Sensor
Light Beam Angle
180
Lumens
2350
Motion Sensing
Yes
Number of Lights
2 Lights
Outdoor Lighting Features
Adjustable Detection Sensitivity,Adjustable Lamp Head,Dusk to Dawn,Motion Sensing,Weather Resistant
Power Options
Hardwired
Power Type
Hardwired
Product Weight (lb.)

1.97lb

Returnable

90-Day

Timer Included

Yes

Voltage

Line Voltage

Watt Equivalence

31.64

Warranty / Certifications

Certifications and Listings

1-UL Listed,ETL Listed,FCC Listed

Manufacturer Warranty

5 Year

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Exclusive

Defiant

270-degree White Motion Activated Outdoor Integrated LED Triple Head Flood Light with Adjustable Color Temperature

★★★★★ (340)

[Write a Review](#)

[Questions & Answers \(43\)](#)

- Adjustable color temperature from warm white to daylight settings
- 3 lamp heads for maximum light coverage
- Easy to install with three easy steps

\$109⁰⁰

Fixture Color/Finish: **White**



Light Beam Angle: 270

180

270

Quantity

-

1

+

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Product Overview

The New Defiant Triple Head Adjustable Color Temperature LED motion security light with DualBrite chases away night time darkness with a bright 2350 lumen light output. The Adjustable Color Temperature Feature allows you to adjust the color temperature from Warm White (3,000k) to Day Light (5,000k). This feature allows you to coordinate outdoor Decorative Lighting and Landscape lighting with your new Security Light for a Safe and Beautiful home.

- Adjustable color temperature feature allows you to adjust the color temperature from warm white (3,000k) to day light (5,000k) with a simple dial control located on the bottom of the motion sensor
- DualBrite 2-level light comes pre-set at a warm white (3,000k) temperature, feature beautifies, protects and saves energy by utilizing accent light from dusk-to-dawn and full light when motion is detected
- Bright LED at 3000 Lumen output
- 3 individual lamp heads allow light placement on the ground where you need it
- 270-degree motion detection with up to 70 ft. range: wall or eave mount
- Tool-free lamp head and sensor adjustment
- DIY friendly with 3 easy steps to installation
- Operating temperature range: -25-degreeC (-13-degreeF) to +50-degreeC (+120-degreeF)
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Specifications

Dimensions

Product Depth (in.)

11.54

Product Height (in.)

6.42

Product Length (in.)

11.54

Product Width (in.)

7.08

Details

Actual Color Temperature (K)

5000

Adjustable Detection Sensitivity

Yes

Adjustable Lamp Head

Yes

Color Rendering Index (CRI)

82

Color Temperature

Daylight

Detection Range (ft.)

70

Dusk to Dawn

Yes

Exterior Lighting Product Type

Floodlights

Fixture Color/Finish
White
Fixture Material
Plastic
Glass/Lens Type
Frosted
Included
Hardware Included,Motion Sensor
Light Beam Angle
270
Lumens
3000
Motion Sensing
Yes
Number of Lights
3 Lights
Outdoor Lighting Features
Adjustable Detection Sensitivity,Adjustable Lamp Head,Dusk to Dawn,Motion Sensing,Weather Resistant
Power Options
Hardwired
Power Type
Hardwired
Product Weight (lb.)

2.61lb

Returnable

90-Day

Timer Included

Yes

Voltage

Line Voltage

Watt Equivalence

44.06

Warranty / Certifications

Certifications and Listings

1-UL Listed,ETL Listed,FCC Listed

Manufacturer Warranty

5 Year

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Defiant 180° White
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Model Number: HZV-5051-WH | Menards® SKU: 3569247



Online Price

\$99⁹⁷
each

Color: White

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Shipping

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Description & Documents

This motion-activated LED security flood light will help bring more security exactly where you need it. With a detection range of 70 feet and a motion detection range of 240 degrees, no space will be left in the dark. The bright, energy saving LED light will automatically turn on when motion is detected and includes the DualBrite® feature. DualBrite® allows the light to provide low-level lighting and illuminates to full brightness when motion is detected for optimal energy savings. The security light also gives you the option to change the color temperature to daylight or to warm white.

Shipping Dimensions: 15.16 H x 9.76 W x 5.91 D

Shipping Weight: 3.75 lbs

Brand Name: **Heath Zenith**



Features

- ColorTune technology allows for change in color temperature
- Mounting hardware included
- DualBrite® technology
- Easy installation mounting plate
- Tool-free sensor and lamp head adjustment
- Dimmable for adjustable light brightness (manual dial on sensor head)
- This LED light has a CRI of 90, an adjustable color temperature of 2700K (Warm light) to 5000K (Daylight), and is 3000 Lumens
- Life expectancy of 30,000 hours

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Specifications



Overall Height	7.2 inch	Overall Width	15.5 inch
Overall Depth	6.2 inch	Weight	2.75 pound
Backplate Dimensions	4.38 inch	Lighting Feature	Motion
Product Type	Security Flood Light	Power Source	Direct Wire
Voltage	120V	Degree of Motion Detection	240
Detection Range	70 foot	Number of Bulbs Required	None (uses Integrated LED)
Maximum Wattage per Socket	45	Total Light Wattage	45
Bulb Type	LED	Bulbs Included	No (Integrated LED)
Light Color Temperature	2700-5000 kelvin	Light Output	3000 lumen
Material	Polycarbonate	Fixture Color Family	White
Fixture Color/Finish	White	Shade/Diffuser Material	Plastic
Shade/Diffuser Color/Finish	Frosted	Recommended Environment	Outdoor
Listing Agency Standards	ETL Listed	Manufacturer Warranty	5 year
View Return Policy			

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Heath Zenith® ColorTune Bronze Integrated LED Tri Head Motion Sensor Outdoor Security Flood Light

Adjustable Color Temperature

Model Number: HZV-5051-BZ | Menards® SKU: 3569248



Online Price

\$99⁹⁷
each

Color: Bronze

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Shipping

Available

Description & Documents

This motion-activated LED security flood light will help bring more security exactly where you need it. With a detection range of 70 feet and a motion detection range of 240 degrees, no space will be left in the dark. The bright, energy saving LED light will automatically turn on when motion is detected and includes the DualBrite® feature. DualBrite® allows the light to provide low-level lighting and illuminates to full brightness when motion is detected for optimal energy savings. The security light also gives you the option to change the color temperature to daylight or to warm white.

Shipping Dimensions: 15.16 H x 9.76 W x 5.91 D

Shipping Weight: 3.75 lbs

Brand Name: **Heath Zenith**



Features

- ColorTune technology allows for change in color temperature
- Mounting hardware included
- DualBrite® technology
- Easy installation mounting plate
- Tool-free sensor and lamp head adjustment
- Dimmable for adjustable light brightness (manual dial on sensor head)
- This LED light has a CRI of 90, an adjustable color temperature of 2700K (Warm light) to 5000K (Daylight), and is 3000 Lumens
- Life expectancy of 30,000 hours

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Specifications



Overall Height	7.2 inch	Overall Width	15.5 inch
Overall Depth	6.2 inch	Weight	2.75 pound
Backplate Dimensions	4.38 inch	Lighting Feature	Motion
Product Type	Security Flood Light	Power Source	Direct Wire
Voltage	120V	Degree of Motion Detection	240
Detection Range	70 foot	Number of Bulbs Required	None (uses Integrated LED)
Maximum Wattage per Socket	45	Total Light Wattage	45
Bulb Type	LED	Bulbs Included	No (Integrated LED)
Light Color Temperature	2700-5000 kelvin	Light Output	3000 lumen
Material	Polycarbonate	Fixture Color Family	Bronze
Fixture Color/Finish	Bronze	Shade/Diffuser Material	Plastic
Shade/Diffuser Color/Finish	Frosted	Recommended Environment	Outdoor
Listing Agency Standards	ETL Listed	Manufacturer Warranty	5 year
View Return Policy			

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Fixture Finish (1)
White  >

1 ▾







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Product Overview

-  Wet Location (Direct Water Exposure)
-  Motion Sensor
-  Dusk to Dawn
-  Adjustable Lamp Head
-  Hardwired




Product Details	→
Shipping & Returns	→
Questions & Answers 1	→
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Do you have questions about this product?
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Product Overview

 Wet Location (Direct Water Exposure)


 Motion Sensor

 Dusk to Dawn


 Adjustable Lamp Head

 Hardwired

Highlights



ColorTune Dial
Selectable color temperature from Warm White to Bright White to Daylight using a simple dial adjustment. Select color temperature to match your current outdoor lighting.



240-Degree Motion Detection
Keep your home safe and secure with motion detection lighting. This product offers 240-degree motion detection, perfect for corners and backyards.

Description

- What's Included?
- ✓ Motion Sensor
 - ✓ Mounting
 - ✓ Installation Hardware

Features

- Color Tune Technology - use a Dial to easily adjust from warm white light to daylight (2700K to 5000K)
- Integrated LED with DualBrite 2 level lighting
- Tool-Free Lamp Head Adjustment and Easy Connect
- White or Bronze Finish Available
- 240 Degree Motion Detection
- 5 year warranty

Product Details

- Country of Origin: China

[See Less](#)

- Weights & Dimensions
- Specifications
- Shipping & Returns
- Questions & Answers 1

Do you have questions about this product?
Our experts are here to help!

Specifications

Features

Product Type	Flood Light
Fixture Material	Plastic
Power Source	Hardwired
Voltage	120 Volts
Dry, Damp or Wet Location Listed	Wet
What is Dry, Damp or Wet Location Listed	This indicates whether the fixture is safe to use in dry locations, damp locations (moist environments), or wet locations (direct exposure to water).
Number of Lamp Heads	3
Dusk to Dawn	Yes
Motion Sensor	Yes
Detection Zone	70 Feet
Detection Angle	240 Degrees
Two-Level Lighting	Yes
Adjustable Lamp Head	Yes
Maximum Wattage (per bulb)	13 Watts
Integrated LED	Yes
Integrated LED Wattage	40 Watts
Integrated LED Brightness (Lumens)	3000 Lumens
What is Integrated LED	This indicates that an LED light is built into the fixture. Integrated LED lights are more energy

What is Integrated LED	This indicates that an LED light is built into the fixture. Integrated LED lights are more energy efficient and can last up to 50,000 hours. They cannot be replaced by the customer.
Dimmable	No
Mounting Placement	Wall/Ceiling
Mounting Included	Yes
Installation Hardware Included	Yes
Supplier Intended and Approved Use	Residential Use
Country of Origin	China

Warranty

Commercial Warranty	No
Product Warranty	Yes
Warranty Length	5 Years


Specifications

Title 20 - California Code of Regulations	Yes
ETL Listed	Yes



About The Shop

Heath Co is the manufacturer and marketer of Heath/Zenith branded products. Through innovation they have compiled a large portfolio of patented technologies and products giving them the competitive edge as an industry leader in the intelligent lighting and door chime markets.



Specifications

Title 20 - California Code of Regulations	Yes
ETL Listed	Yes

Heath/Zenith

About The Shop

Heath Co is the manufacturer and marketer of Heath/Zenith branded products. Through innovation they have compiled a large portfolio of patented technologies and products giving them the competitive edge as an industry leader in the intelligent lighting and door chime markets.

More About This Product

When you buy a Heath-Zenith Colortune 13-Watt LED Dusk to Dawn Outdoor Security Flood Light with Motion Sensor online from Wayfair, we make it as easy as possible for you to find out when your product will be delivered. Read customer reviews and common Questions and Answers for Heath-Zenith Part #: HZ-5051- on this page. If you have any questions about your purchase or any other product for sale, our customer service representatives are available to help. Whether you just want to buy a Heath-Zenith Colortune 13-Watt LED Dusk to Dawn Outdoor Security Flood Light with Motion Sensor or shop for your entire home, Wayfair has a zillion things home.

Shipping & Returns

Questions & Answers 1

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Motion Lighting - HeathZenith

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HZ-5051

MOTION LIGHTING

- Energy Saving LED Technology
- 3000 LM Output
- 240 Degree Motion Activated
- Adjustable Up To 70 ft Range
- Adjustable ON TIME
- DualBrite - 2 Level Lighting
- Frosted Lamp Lens
- Patented Easy Install Feature
- Tool- free Lamp Head and Sensor Adjustments
- Eave or Wall Mount
- Durable Polycarbonate - Rust Resistant Fixture

Dimensions: 14.75" w x 5.75" d x 6.75" h
Weight (lbs): 2.54
Lumens: 3000
Color Temperature: Adjustable Color Tune
Integrated LED: Yes
Motion Detection: Yes
DualBrite: With fixed 3000K CCT
Dusk-to-Dawn: When in DualBrite
Manual Override: Yes
Eave Mount: Yes
Wall Mount: Yes
Power Type: Wired
Agency: C-ETL-US
Warranty (Yrs): 5
Color: Bronze and white

EXHIBIT M

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Internet #308772843 Model # HZ-8813-BZ

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Heath Zenith
Twin Head Bronze Outdoor Integrated LED Dusk to Dawn
Activated Flood Light with Adjustable Color Temperature

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\$72⁵⁸

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Fixture Color/Finish: **Bronze**

Bronze

White

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Product Overview

Introducing Color Tune technology that allows exterior home lighting to be customized from a warm white to daylight color temperature using a simple adjustable dial located on the light. Photocell technology allows the light to operate from dusk to dawn at night time only. LED technology provides long lasting bright energy efficient lighting from safety and security around the perimeter of the home.

- Adjustable color temperature from warm white to daylight by simple dial control
- Operates from dusk-to-dawn
- 1850 Lumens output
- Twin lamp head design with tool-free adjustment
- Energy efficient LED technology
- White finish
- 5 year warranty
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Heath Zenith Twin Head Bronze Outdoor Integrated LED Dusk to Dawn Activated Flood Light with Adjustable...

(0)

\$72⁵⁸ each

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(0)

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(4)

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PROBRITE 14-Watt Integrated LED Area and

(3)

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Specifications

Dimensions

Product Depth (in.)
6
Product Height (in.)
4.50
Product Length (in.)
6
Product Width (in.)

8.75 in

Details

Actual Color Temperature (K)

5000

Adjustable Detection Sensitivity

No

Adjustable Lamp Head

Yes

Color Rendering Index (CRI)

84

Color Temperature

White Adjustable Light

Detection Range (ft.)

0

Dusk to Dawn

Yes

Exterior Lighting Product Type

Floodlights

Fixture Color/Finish

Bronze

Fixture Material

Plastic

Glass/Lens Type

Frosted



Included
Mounting Hardware Included
Lumens
1850
Motion Sensing
No
Number of Lights
2 Lights
Outdoor Lighting Features
Adjustable Lamp Head,Dusk to Dawn,Weather Resistant
Pack Size
1 Pack
Power Options
Hardwired
Power Type
Line voltage
Product Weight (lb.)
1.39lb
Returnable
90-Day
Timer Included
No
Voltage



Line Voltage

Voltage Type

Line Voltage

Warranty / Certifications

Certifications and Listings

ETL Listed

Manufacturer Warranty

5 Year



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Internet #308772819 Model # HZ-8813-WH

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Heath Zenith

Twin Head White Outdoor Integrated LED Dusk to Dawn
Activated Flood Light with Adjustable Color Temperature

★★★★★ (1)

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\$77⁵⁹

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Fixture Color/Finish: **White**

Bronze

White

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Product Overview

Introducing Color Tune technology that allows the exterior home lighting to be customized from a warm white to daylight color temperature using a simple adjustable dial located on the light. Photocell technology allows that light to operate from dusk to dawn at night time only. LED technology provides long lasting bright energy efficient lighting for safety and security around the perimeter of the home.

- Adjustable color temperature from warm white to daylight by a simple dial control
- Operates from dusk to dawn only
- 1850 Lumens output
- Twin lamp head design with toll-free adjustment
- Energy efficient LED technology
- White finish
- 5 year warranty
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Heath Zenith Twin Head
White Outdoor Integrated
LED Dusk to Dawn Activated
Flood Light with Adjustable...

(1)

\$77⁵⁹ each

☒ Item Selected



Heath Zenith Triple
Head Outdoor
Integrated LED Dusk
to Dawn Activated ...

(1)

\$103⁷⁸

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Current Product



Heath Zenith Twin Head
White Outdoor Integrated
LED Dusk to Dawn Activated

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PROBRITE Architectural Round 50 Watt,

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Was ~~\$278~~

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PROBRITE 14-Watt Integrated LED Area and

(3)

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Was ~~\$139.96~~

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PROBRITE Bright Bronze 20-Watt Integrated LED

(5)

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Was ~~\$119.96~~

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PROBRITE 14-Watt Integrated LED

(12)

\$103⁹⁶/package
Was ~~\$129.96~~

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Specifications

Dimensions

Product Depth (in.)
6
Product Height (in.)
4.5
Product Length (in.)
6
Product Width (in.)

8.75 in

Details

Actual Color Temperature (K)

5000

Adjustable Detection Sensitivity

No

Adjustable Lamp Head

Yes

Color Rendering Index (CRI)

84

Color Temperature

White Adjustable Light

Detection Range (ft.)

0

Dusk to Dawn

Yes

Exterior Lighting Product Type

Floodlights

Fixture Color/Finish

White

Fixture Material

Plastic

Glass/Lens Type

Frosted



Included
Mounting Hardware Included
Lumens
1850
Motion Sensing
No
Number of Lights
2 Lights
Outdoor Lighting Features
Adjustable Lamp Head,Dusk to Dawn,Weather Resistant
Pack Size
1 Pack
Power Options
Hardwired
Power Type
Line voltage
Product Weight (lb.)
1.39lb
Returnable
90-Day
Timer Included
No
Voltage



Line Voltage

Voltage Type

Line Voltage

Warranty / Certifications

Certifications and Listings

ETL Listed

Manufacturer Warranty

5 Year

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Heath Zenith Twin
Head Bronze
Outdoor Integrated
NOT YET RATED

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Internet #309814994 Model # HZ-8814-BZ

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Heath Zenith
Triple Head Outdoor Integrated LED Dusk to Dawn Activated Flood Light with Adjustable Color Temperature

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\$96⁹⁹

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Fixture Color/Finish: **Bronze**

Bronze

White

☐

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Quantity

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Product Overview

Introducing Color Temperature technology that allows exterior home lighting to be customized from a warm white to daylight color temperature using a simple adjustable dial located on the light. Photocell technology allows that light to operate from dusk to dawn with LED technology that provides long lasting bright energy efficient lighting for safety and security around the perimeter of the home. The light fixture has a three robust lamp head design which provides the ability to focus light where needed in large areas.

- Adjustable color temperature from warm white to daylight by simple dial control
- Operates from dusk-to-dawn only
- Bright 3100 Lumens output
- Triple lamp head design with tool-free adjustment
- Energy efficient LED technology
- Bronze finish
- 5 year warranty
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Current Product



Heath Zenith Triple Head Outdoor Integrated LED Dusk to Dawn Activated Flood Light with Adjustable...

(0)

\$96⁹⁹ each

☒ Item Selected



Heath Zenith Twin Head Bronze Outdoor Integrated LED Dusk to Dawn Activated ...

(0)

\$72⁵⁸

☐ Select This Item

Live Chat

1 Item Selected 

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Current Product



Heath Zenith Triple Head
Outdoor Integrated LED
Dusk to Dawn Activated

Sponsored Products




PROBRITE High-Output 40-Watt Integrated LED

(126)

\$127⁹⁶/package
Was ~~\$159.96~~

Add To Cart




PROBRITE Architectural Round 50 Watt,

(12)

\$222⁴⁰/package
Was ~~\$278~~

Add To Cart




PROBRITE 14-Watt Integrated LED Area and

(3)

\$111⁹⁶/package
Was ~~\$139.96~~

Add To Cart




PROBRITE Bright Bronze 20-Watt Integrated LED

(5)

\$95⁹⁶/package
Was ~~\$119.96~~

Add To Cart




PROBRITE 14-Watt Integrated LED

(12)

\$103⁹⁶/package
Was ~~\$129.96~~

Add To Cart



Specifications

Dimensions

Product Depth (in.)
6
Product Height (in.)
4.5
Product Length (in.)
6
Product Width (in.)

13.25 in

Details

Actual Color Temperature (K)

5000

Adjustable Detection Sensitivity

No

Adjustable Lamp Head

Yes

Color Rendering Index (CRI)

84

Color Temperature

White Adjustable Light

Detection Range (ft.)

0

Dusk to Dawn

Yes

Exterior Lighting Product Type

Floodlights

Fixture Color/Finish

Bronze

Fixture Material

Plastic

Glass/Lens Type

Frosted



Included
Mounting Hardware Included
Lumens
3100
Motion Sensing
No
Number of Lights
3 Lights
Outdoor Lighting Features
Adjustable Lamp Head,Dusk to Dawn,Weather Resistant
Pack Size
1 Pack
Power Options
Hardwired
Power Type
Line voltage
Product Weight (lb.)
3lb
Returnable
90-Day
Timer Included
No
Voltage



Line Voltage

Voltage Type

Line Voltage

Warranty / Certifications

Certifications and Listings

ETL Listed

Manufacturer Warranty

5 year

Live Chat

How can we improve our product information? Provide feedback.

Recently Viewed Items



Heath Zenith Twin
Head White
Outdoor Integrated

(1)



Heath Zenith Twin
Head Bronze
Outdoor Integrated

NOT YET RATED

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Internet #309815011 Model # HZ-8814-WH

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Heath Zenith
Triple Head Outdoor Integrated LED Dusk to Dawn Activated
Flood Light with Adjustable Color Temperature

★★★★★ (1) [Write a Review](#) [Questions & Answers \(1\)](#)

\$103⁷⁸

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Fixture Color/Finish: **White**

Bronze

White

☐

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Quantity

-

1

+

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Product Overview

Introducing Color Temperature technology allows exterior home lighting to be customized from a warm white to daylight color temperature using a simple adjustable dial located on the light. Photocell technology allows the light to operate from dusk to dawn with LED technology that provides long lasting bright energy efficient lighting for safety and security around the perimeter of the home. The light fixture has a three robust lamp head design which provides the ability to focus light where needed in large areas.

- Adjustable color temperature from warm white to daylight by simple dial control
- Operates from dusk-to-dawn only
- Bright 3100 Lumens output
- Triple lamp head design with tool-free adjustment
- Energy efficient LED technology
- White finish
- 5 year warranty
- [Click here for more information on Electronic Recycling Programs](#)


Info & Guides

- [Warranty](#)

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Current Product



Heath Zenith Triple Head Outdoor Integrated LED Dusk to Dawn Activated Flood Light with Adjustable...
(1)

\$103⁷⁸ each


☒ Item Selected



Heath Zenith Twin Head White Outdoor Integrated LED Dusk to Dawn Activated ...
(1)

\$77⁵⁹

☐ Select This Item



Heath Zenith 180-Degree White Motion Activated Outdoor Flood Light ...
(2)

\$14⁵⁴

☐ Select This Item

Live Chat

1 Item Selected




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Sponsored Products




PROBRITE High-Output 40-Watt Integrated LED

(126)

\$127⁹⁶/package
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PROBRITE Architectural Round 50 Watt,

(12)

\$222⁴⁰/package
Was ~~\$278~~

Add To Cart




PROBRITE 14-Watt Integrated LED Area and

(3)

\$111⁹⁶/package
Was ~~\$139.96~~

Add To Cart




PROBRITE Bright Bronze 20-Watt Integrated LED

(5)

\$95⁹⁶/package
Was ~~\$119.96~~

Add To Cart




PROBRITE 14-Watt Integrated LED

(12)

\$103⁹⁶/package
Was ~~\$129.96~~

Add To Cart



Specifications

Dimensions

Product Depth (in.)
6
Product Height (in.)
4.50
Product Length (in.)
6
Product Width (in.)

13.25 in

Details

Actual Color Temperature (K)

5000

Adjustable Detection Sensitivity

No

Adjustable Lamp Head

Yes

Color Rendering Index (CRI)

84

Color Temperature

White Adjustable Light

Detection Range (ft.)

0

Dusk to Dawn

Yes

Exterior Lighting Product Type

Floodlights

Fixture Color/Finish

White

Fixture Material

Plastic

Glass/Lens Type

Frosted



Included
Mounting Hardware Included
Lumens
3100
Motion Sensing
No
Number of Lights
3 Lights
Outdoor Lighting Features
Adjustable Lamp Head,Dusk to Dawn,Weather Resistant
Pack Size
1 Pack
Power Options
Hardwired
Power Type
Line voltage
Product Weight (lb.)
3lb
Returnable
90-Day
Timer Included
No
Voltage



Line Voltage

Voltage Type

Line Voltage

Warranty / Certifications

Certifications and Listings

ETL Listed

Manufacturer Warranty

5 year

Live Chat

Recently Viewed Items



Heath Zenith
Triple Head
Outdoor Integrated

(0)



Heath Zenith Twin
Head White
Outdoor Integrated

(1)



Heath Zenith Twin
Head Bronze
Outdoor Integrated

NOT YET RATED

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12-Watt LED Dusk to Dawn Outdoor Security Flood Light

See More from [Heath-Zenith](#)





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Fixture Finish (1)
White

 >

1 ▼



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Product Overview



Wet Location (Direct Water Exposure)



Dusk to Dawn



Adjustable Lamp Head



Hardwired

Highlights



ColorTune Dial

Selectable color temperature from Warm White to Bright White to Daylight using a simple dial adjustment. Select color temperature to match your current outdoor lighting.

[See More](#)

Description



Features

- Adjustable color temperature from warm white to daylight settings
- Tool-free lamp head adjustment

Ex. M - Page 39 of 45

Product Details

- Country of Origin: China

Weights & Dimensions

▼

Specifications

▼

Shipping & Returns

▼

Questions & Answers

▼

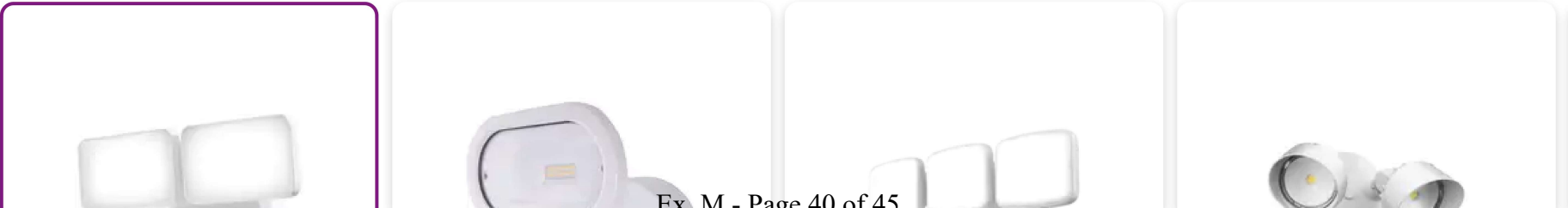
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12-Watt LED Dusk to Dawn Outdoor Security Flood...
by Heath-Zenith

\$83.99

0

Add




14-Watt LED Flood Light
by Nuvo Lighting

\$86.87

0

[See Details](#)




37-Watt LED Dusk to Dawn Outdoor Security Flood...
by Heath-Zenith

\$105.99

4

[See Details](#)



20-Watt LED Dusk to Dawn Outdoor Security Flood...
by Lithonia Lighting

\$48.99

58

[See Details](#)

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Current Item










Customers Also Viewed




Outdoor Security Flood Light with Motion Sensor by Heathco

\$28.99

9

Closeout




OFL 26-Watt LED Outdoor Security Flood Light by Lithonia Lighting

\$65.99

29


Sale



30-Watt LED Dusk to Dawn Outdoor Security Flood... by SANSI

\$58.99

1



LED Dusk to Dawn Outdoor Security Flood Light with... by Good Earth Lighting

\$71.99

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Internet #309142410 Model # DF-5909-WH Store SKU #1004365415



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Exclusive

Defiant

270-Degree White Motion Outdoor Integrated LED Flood Light with Clearview Edgelit Translucent Light Panel Technology

★★★★★ (10) [Write a Review](#) [Questions & Answers \(3\)](#)

- Unique Clear Lamp Head Panels - blends in w/exterior of your home
- 2000 Lumens - seamless bright light

- LED Lit Touch Sensor controls

\$119⁹⁷

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Quantity

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Product Overview

Make your home more secure and stylish with this motion activated outdoor flood light. The ClearView Edgelit Translucent Light Panel Technology feature lets the light fixture blend in to your home exterior. The new technology allows dim accent light to shine from the back of the panels to create a soft wall wash ambient lighting affect. This fixture gives a warm white color temperature of 3000K at a bright 2000 Lumens. The DualBrite feature allows dim accent light from dusk to dawn and full bright when motion is detected.

- ClearView Edgelit translucent LED light panel technology
- DualBrite 2-level lighting comes on at a warm white (3000K) temperature which beautifies, protects and save energy by utilizing accent light from dusk to dawn and full light when motion is detected
- Bright LED at 2000 Lumens output
- 270° motion detection up to 50 ft. range/features LED light sensor indicators for easy adjustments and notifications of functionality
- Tool-free lamp head and sensor adjustment
- DIY friendly with 2 easy steps to installation
- Eave or wall mount
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Info & Guides

- [Installation Guide](#)

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Current Product



Defiant 270-Degree White Motion Outdoor Integrated LED Flood Light with Clearview Edgelit ...

(10)

\$ **119**⁹⁷ each

☒ Item Selected



Defiant 180-Degree White Motion Activated Outdoor Flood Light

(554)

\$ **27**⁹⁷

☐ Select This Item



Defiant 270 Degree Bronze Motion Outdoor Integrated LED Flood Light wit...

(13)

\$ **119**⁹⁷

☐ Select This Item

1 Item Selected

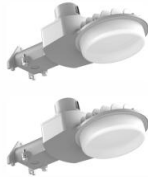






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PROBRITE High-Output 40-Watt Integrated LED	PROBRITE Architectural Round 50 Watt,	PROBRITE 15-Watt Integrated LED Wall Pack	PROBRITE 14-Watt Integrated LED Area and	PROBRITE Bronze Integrated LED
(126)	(12)	(21)	(3)	(1)
\$127⁹⁶ /package Was \$159.96	\$222⁴⁰ /package Was \$278	\$103⁹⁶ /package Was \$129.96	\$111⁹⁶ /package Was \$139.96	\$95⁹⁶ /package Was \$119.96
Add To Cart	Add To Cart	Add To Cart	Add To Cart	Add To Cart

Specifications

Dimensions

Assembled Depth (in.)
7.74 in
Assembled Height (in.)
6.32 in
Assembled Width (in.)
13.96 in
Product Depth (in.)

6.32

Product Height (in.)

7.74

Product Length (in.)

6.32

Product Width (in.)

13.96 in

Details

Actual Color Temperature (K)

2769

Adjustable Detection Sensitivity

Yes

Adjustable Lamp Head

Yes

Color Rendering Index (CRI)

80.5

Color Temperature

Soft White

Detection Range (ft.)

50

Dusk to Dawn

Yes

Electrical Features

Weather Resistant

Exterior Lighting Product Type
Floodlights
Fixture Color/Finish
White
Fixture Material
Metal
Glass/Lens Type
Textured
Included
Mounting Hardware Included
Light Beam Angle
270
Light Bulb Type Included
Smart LED Bulbs
Lumens
2000
Motion Sensing
Yes
Number of Lights
1 Light
Outdoor Lighting Features
Adjustable Detection Sensitivity,Adjustable Lamp Head,Dusk to Dawn,Motion Sensing,Weather Resistant,Weather Resistant

Pack Size

1 Pack

Pack Size

1 Pack

Power Options

Hardwired

Power Type

Line voltage

Product Weight (lb.)

2.17lb

Returnable

90-Day

Timer Included

Yes

Voltage

Line Voltage

Voltage Type

Line Voltage

Warranty / Certifications

Certifications and Listings

ETL Listed,FCC Listed

Manufacturer Warranty

5 Years

How can we improve our product information? Provide feedback.

Recently Viewed Items



Heath Zenith
Triple Head
Outdoor Integrated
(1)



Heath Zenith
Triple Head
Outdoor Integrated
(0)



Heath Zenith Twin
Head White
Outdoor Integrated
(1)



Heath Zenith Twin
Head Bronze
Outdoor Integrated
NOT YET RATED

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Model # DFI-5983-WH Internet #205937583 Store SKU #1001311060



Live Chat



Weather Resistant



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Exclusive

Defiant
180 Degree White LED Motion Outdoor Security Light

★★★★★ (785) [Write a Review](#) [Questions & Answers \(185\)](#)

- Hardwired Floodlight featuring Wall or Eave-mount Installation
- 180-degree motion detection with up to 70 ft. range
- LED light produces 2050 lumens with 24.99 watt equivalence

\$69⁹⁷

Fixture Color/Finish: **White**





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Quantity

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1

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Product Overview



The New Defiant 180-Degree LED motion security light with DualBrite chases away nighttime darkness. This LED motion light provides seamless light coverage for increased safety, security and peace of mind. Never change a bulb again with this new LED technology. Install quickly and safely with three friendly, DIY easy steps to connect. The DualBrite feature beautifies, protects and saves energy by utilizing accent light from dusk-to-dawn and full light when motion is detected.

- Bright LED light at 2050 lumens of output
- 180-degree motion detection with up to 70 ft. range
- DualBrite 2-level lighting technology
- Can be mounted on walls or eaves
- Need help choosing outdoor lighting? check out our buying guide for helpful tips.
- Operating temperature range: -25°C (-13°F) to +50°C (+120°F)
- [Click here for more information on Electronic Recycling Programs](#)



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Specifications

Dimensions

Product Depth (in.)

7.25

Product Height (in.)

7.375

Product Length (in.)

7.25

Product Width (in.)

8.5

Details

Actual Color Temperature (K)

5000

Adjustable Detection Sensitivity

Yes

Adjustable Lamp Head

Yes

Color Rendering Index (CRI)

82

Color Temperature

Daylight

Detection Range (ft.)

70

Dusk to Dawn

Yes

Electrical Features

Timer, Weather Resistant

Exterior Lighting Product Type

Floodlights

Fixture Color/Finish

White



Fixture Material
Plastic
Glass/Lens Type
Frosted
Included
Hardware Included,Motion Sensor,Timer
Light Beam Angle
180
Light Bulb Type Included
SMD LED
Lumens
2050
Motion Sensing
Yes
Number of Lights
2 Lights
Outdoor Lighting Features
Adjustable Detection Sensitivity,Adjustable Lamp Head,Dusk to Dawn,Motion Sensing,Timer,Weather Resistant
Power Options
Hardwired
Power Type
Hardwired
Product Weight (lb.)



1.39lb
Returnable
90-Day
Timer Included
Yes
Voltage
Line Voltage
Watt Equivalence
24.99

Live Chat

Warranty / Certifications

Certifications and Listings
1-UL Listed,cUL Listed
Manufacturer Warranty
5 Years

How can we improve our product information? Provide feedback.

Recently Viewed Items



Defiant 270-
degree White



Defiant 180° White
Motion Activated



Defiant 180°
Bronze Motion



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Model # DFI-5983-BZ Internet #205937641 Store SKU #1001318510



Weather Resistant



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Exclusive

Defiant

180 Bronze LED Motion Outdoor Security Light

★★★★★ (785)

[Write a Review](#)

[Questions & Answers \(185\)](#)

- Hardwired Floodlight featuring Wall or Eave-mount Installation
- 180-degree motion detection with up to 70 ft. range
- LED light produces 2050 lumens with 24.99 watt equivalence

\$69⁹⁷

Fixture Color/Finish: **Bronze**





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Quantity

-

1

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Product Overview

The New Defiant LED motion security light with DualBrite chases away night time darkness. This LED motion light provides seamless light coverage for increased safety, security and peace of mind. Never change a bulb with this new LED technology. Install quickly and safely with DIY friendly 3 Easy Steps to Connect. The DualBrite feature beautifies, protects and saves energy by utilizing accent light from Dusk-to-Dawn and full light when motion is detected.

- Bright LED light at 2050 lumen output
- 180 degree motion detection with up to 70 ft. range
- DualBrite 2-level lighting technology
- Wall or eave mount
- Need help choosing outdoor lighting? check out our buying guide for helpful tips.
- Operating temperature range: -25°C (-13°F) to +50°C (+120°F)
- [Click here for more information on Electronic Recycling Programs](#)

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Specifications

Dimensions

Product Depth (in.)

7.25

Product Height (in.)

7.375

Product Length (in.)

7.25

Product Width (in.)

8.5

Details

Actual Color Temperature (K)

5000

Adjustable Detection Sensitivity

Yes

Adjustable Lamp Head

Yes

Color Rendering Index (CRI)

82

Color Temperature

Daylight

Detection Range (ft.)

70

Dusk to Dawn

Yes

Electrical Features

Timer, Weather Resistant

Exterior Lighting Product Type

Floodlights

Fixture Color/Finish

Bronze

Fixture Material
Plastic
Glass/Lens Type
Frosted
Included
Timer
Light Beam Angle
180
Light Bulb Type Included
SMD LED
Lumens
2050
Motion Sensing
Yes
Number of Lights
2 Lights
Outdoor Lighting Features
Adjustable Detection Sensitivity,Adjustable Lamp Head,Dusk to Dawn,Motion Sensing,Timer,Weather Resistant
Power Options
Hardwired
Power Type
Hardwired
Product Weight (lb.)

1.39lb

Returnable

90-Day

Timer Included

Yes

Voltage

Line Voltage

Watt Equivalence

24.99

Warranty / Certifications

Certifications and Listings

1-UL Listed,cUL Listed

Manufacturer Warranty

5 Years

Recently Viewed Items



Defiant 180
Degree White LED
Motion Outdoor



Defiant 270-
degree White
Motion Activated



Defiant 180° White
Motion Activated
Outdoor Integrated



Defiant 180°
Bronze Motion
Activated Outdoor

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Model # DFI-5988-WH Internet #205937582 Store SKU #1001311064



Weather Resistant



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Exclusive

Defiant

270 Degree 3-Head White LED Motion Outdoor Security Light

★★★★★ (393)

[Write a Review](#)

[Questions & Answers \(67\)](#)

- Hardwired Floodlight featuring Wall or Eave-mount Installation
- 270-degree motion detection with up to 70 ft. range
- LED light produces 2450 lumens with 29.23 watt equivalence

\$89⁹⁷

Fixture Color/Finish: **White**



Light Beam Angle: **270**

270

☐

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Quantity

-

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Product Overview

The New Defiant LED motion security light chases away night time darkness. The NEW innovative 3 lamp head design offers unlimited light coverage options to provide increased safety, security, and peace of mind. Never change a bulb with this new LED technology. 3 Easy Steps to Connect is DIY friendly and allows quick safe installation. A DualBrite feature beautifies, protects and saves energy by utilizing accent light from Dusk-to-Dawn and full light when motion is detected.

- Bright LED light at 2450 Lumen output
- 270 degree motion detection with up to 70 ft. range
- 3 lamp heads for increased light coverage
- DualBrite 2-level lighting
- Wall or eave mount
- Need help choosing outdoor lighting? check out our buying guide for helpful tips.
- Operating temperature range: -25°C (-13°F) to +50°C (+120°F)
- [Click here for more information on Electronic Recycling Programs](#)

Info & Guides

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Specifications

Dimensions

Product Depth (in.)

6.19

Product Height (in.)

8.125

Product Length (in.)

6.19

Product Width (in.)

9.25

Details

Actual Color Temperature (K)

5000

Adjustable Detection Sensitivity

Yes

Adjustable Lamp Head

Yes

Color Rendering Index (CRI)

68

Color Temperature

Daylight

Detection Range (ft.)

70

Dusk to Dawn

No

Exterior Lighting Product Type

Floodlights

Fixture Color/Finish

White
Fixture Material
Plastic
Glass/Lens Type
Frosted
Included
Hardware Included,Motion Sensor,Timer
Light Beam Angle
270
Lumens
2450
Motion Sensing
Yes
Number of Lights
3 Lights
Outdoor Lighting Features
Adjustable Detection Sensitivity,Adjustable Lamp Head,Dusk to Dawn,Motion Sensing,Timer,Weather Resistant
Power Options
Hardwired
Power Type
Hardwired
Product Weight (lb.)
1.66lb

Returnable

90-Day

Timer Included

Yes

Voltage

Line Voltage

Watt Equivalence

29.23

Warranty / Certifications

Certifications and Listings

1-UL Listed,cUL Listed

Manufacturer Warranty

5 Years

Recently Viewed Items





Defiant 180
Bronze LED
Motion Outdoor

(785)





Defiant 180
Degree White LED
Motion Outdoor

(785)





Defiant 270-
degree White
Motion Activated

(340)





Defiant 180° White
Motion Activated
Outdoor Integrated

(340)





Defiant
Bronze
Activated

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Model # DFI-5988-BZ

Internet #300486585

Store SKU #1002169632



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Exclusive

Defiant

270 Degree Bronze Motion Outdoor Integrated LED Security Light

★★★★★ (393)

[Write a Review](#)

[Questions & Answers \(67\)](#)

- Hardwired Floodlight featuring Wall or Eave-mount Installation
- 270-degree motion detection with up to 70 ft. range
- Integrated LED produces 2450 lumens with 29.23-watt equivalence

\$105⁷³

Fixture Color/Finish: **Bronze**



Light Beam Angle: 270

270

Quantity

-

1

+

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Product Overview

The New Defiant LED motion security light chases away night time darkness. The NEW innovative 3-lamp head design offers unlimited light coverage options to provide increased safety, security, and peace of mind. Never change a bulb with this new LED technology. 3 Easy Steps to Connect is DIY friendly and allows quick safe installation. A DualBrite feature beautifies, protects and saves energy by utilizing accent light from Dusk-to-Dawn and full light when motion is detected.

- Bright LED light at 2450 Lumen output
- 270 degree motion detection with up to 70 ft. range
- 3 lamp heads for increased light coverage
- DualBrite 2-level lighting
- 1-2-3 easy install
- Manual override ability for constant light when needed
- Wall and eave mount
- Operating temperature range: -25-degreeC (-13-degreeF) to +50-degreeC (+120-degreeF)
- [Click here for more information on Electronic Recycling Programs](#)

Info & Guides

- [FAQ](#)
- [Instructions / Assembly](#)
- [Troubleshooting Guide](#)
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Specifications

Dimensions

Product Depth (in.)

6.19

Product Height (in.)

8.125

Product Length (in.)

6.19

Product Width (in.)

9.25

Details

Actual Color Temperature (K)

5000

Adjustable Detection Sensitivity

Yes

Adjustable Lamp Head

Yes

Color Rendering Index (CRI)

68

Color Temperature

Daylight

Detection Range (ft.)

70

Dusk to Dawn

Yes

Exterior Lighting Product Type

Floodlights

Fixture Color/Finish

Bronze
Fixture Material
Plastic
Glass/Lens Type
Frosted
Included
Hardware Included,Motion Sensor,Timer
Light Beam Angle
270
Lumens
2450
Motion Sensing
Yes
Number of Lights
3 Lights
Outdoor Lighting Features
Adjustable Detection Sensitivity,Adjustable Lamp Head,Dusk to Dawn,Motion Sensing,Weather Resistant
Power Options
Hardwired
Power Type
Hardwired
Product Weight (lb.)
1.66lb

Returnable
90-Day
Timer Included
Yes
Voltage
Line Voltage
Watt Equivalence
29.23

Warranty / Certifications

Certifications and Listings
1-UL Listed
Manufacturer Warranty
5 Years

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Defiant 270 Degree 3-Head White LED Motion	Defiant 180 Bronze LED Motion Outdoor	Defiant 180 Degree White LED Motion Outdoor	Defiant 270- degree White Motion Activated	Defian Motion Outdoc
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Model # DFI-5985-WH Internet #205937594 Store SKU #1001311061



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Defiant

270 Degree White LED Bluetooth Motion Outdoor Security Light

★★★★★ (393) [Write a Review](#) [Questions & Answers \(139\)](#)

- Hardwired Floodlight featuring Wall or Eave-mount Installation
- 270-degree motion detection with up to 70 ft. range
- LED light produces 2350 lumens with 26.53 watt equivalence

\$109⁰⁰

Fixture Color/Finish: **White**





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Quantity

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Product Overview

The New Defiant Bluetooth smart LED motion security light with DualBrite chases away night time darkness. No need to climb ladders for motion sensor adjustment as the innovative use of Bluetooth smart Technology allows sensor control from your smart phone device. Bluetooth smart technology allows control of light level outside your home by adjustable dimming feature. LED technology provides no bulbs to change. Install quick and safely with DIY friendly 3 Easy Steps to Connect. The DualBrite feature protects and saves energy by utilizing accent light from Dusk-to-Dawn and full light when motion is detected.

- Bluetooth smart technology allows you to control sensor settings right from your phone
- Bright LED light at 2300 Lumen output
- 270 degree motion detection with up to 70 ft. range, wall or eave mount
- DualBrite 2-level lighting
- Works with iPhone 4S or later, works with android version 4.3 or later, phone requires bluetooth version 4.0 or later
- Need help choosing outdoor lighting? check out our buying guide for helpful tips.
- Operating temperature range: -25°C (-13°F) to +50°C (+120°F)
- [Click here for more information on Electronic Recycling Programs](#)

Info & Guides

- [FAQ](#)
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- [Use and Care Manual](#)
- [Warranty](#)

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Specifications

Dimensions

Product Depth (in.)

5.88

Product Height (in.)

8.875

Product Length (in.)

5.88

Product Width (in.)

11

Details

Actual Color Temperature (K)

5000

Adjustable Detection Sensitivity

Yes

Adjustable Lamp Head

Yes

Color Rendering Index (CRI)

83

Color Temperature

Daylight

Detection Range (ft.)

70

Dusk to Dawn

No

Exterior Lighting Product Type

Floodlights

Fixture Color/Finish
White
Fixture Material
Plastic
Glass/Lens Type
Frosted
Hub Required
No hub connection available
Included
Timer
Light Beam Angle
270
Lumens
2350
Motion Sensing
Yes
Number of Lights
2 Lights
Outdoor Lighting Features
Adjustable Detection Sensitivity,Adjustable Lamp Head,Dusk to Dawn,Motion Sensing,Timer,Weather Resistant
Power Options
Hardwired
Power Options

Hardwired
Power Type
Hardwired
Product Weight (lb.)
1.66lb
Remote Access
No Remote Access
Requires Hub?
No Hub Required
Returnable
90-Day
Smart Home
Smart Home Enabled
Smart Home Protocol
Bluetooth
Timer Included
Yes
Voice Control Hub Required
No Voice Control
Voltage
Line Voltage
Watt Equivalence
28.53
Works With

Proprietary App

Warranty / Certifications

Certifications and Listings

1-UL Listed,cUL Listed

Manufacturer Warranty

5 Years

Recently Viewed Items



Defiant 270
Degree Bronze
LED Bluetooth

(393)



Defiant 270
Degree 3-Head
White LED Motion

(393)



Defiant 180
Bronze LED
Motion Outdoor

(785)



Defiant 180
Degree White LED
Motion Outdoor

(785)



Defiant
degree
Motion

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Exclusive

Defiant

270 Degree Bronze LED Bluetooth Motion Outdoor Security Light

★★★★★ (393) [Write a Review](#) [Questions & Answers \(139\)](#)

- Hardwired Floodlight featuring Wall or Eave-mount Installation
- 270-degree motion detection with up to 70 ft. range
- LED light produces 2350 lumens with 28.53 watt equivalence

\$99⁹⁷

Fixture Color/Finish: **Bronze**





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Product Overview

The New Defiant Bluetooth smart LED motion security light with DualBrite chases away night time darkness. No need to climb ladders for motion sensor adjustment as the innovative use of Bluetooth smart Technology allows sensor control from your smart phone device. Bluetooth smart technology allows control of light level outside your home by adjustable dimming feature. LED technology provides no bulbs to change. Install quick and safely with DIY friendly 3 Easy Steps to Connect. The DualBrite feature protects and saves energy by utilizing accent light from Dusk-to-Dawn and full light when motion is detected.

- Bluetooth smart technology allows you to control sensor settings right from your phone
- Bright LED light at 2300 Lumen output
- 270 degree motion detection with up to 70 ft. range, wall or eave mount
- DualBrite 2-level lighting
- Works with iPhone 4S or later, works with android version 4.3 or later, phone requires bluetooth version 4.0 or later
- 5000K color temperature for security brightness
- Dimmable light level from the App on your phone
- Free downloadable App
- Operating temperature range: -25°C (-13°F) to +50°C (+120°F)
- [Click here for more information on Electronic Recycling Programs](#)

Info & Guides

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Specifications

Dimensions

Product Depth (in.)

5.88

Product Height (in.)

8.875

Product Length (in.)

5.88

Product Width (in.)

11

Details

Actual Color Temperature (K)

5000

Adjustable Detection Sensitivity

Yes

Adjustable Lamp Head

Yes

Color Rendering Index (CRI)

83

Color Temperature

Daylight

Detection Range (ft.)

70

Dusk to Dawn

No

Exterior Lighting Product Type
Floodlights
Fixture Color/Finish
Bronze
Fixture Material
Plastic
Glass/Lens Type
Frosted
Hub Required
No hub connection available
Included
Hardware Included,Motion Sensor,Timer
Light Beam Angle
270
Lumens
2350
Motion Sensing
Yes
Number of Lights
2 Lights
Outdoor Lighting Features
Adjustable Detection Sensitivity,Adjustable Lamp Head,Dusk to Dawn,Motion Sensing,Timer,Weather Resistant
Power Options

Hardwired
Power Options
Hardwired
Power Type
Hardwired
Product Weight (lb.)
1.66lb
Remote Access
No Remote Access
Requires Hub?
No Hub Required
Returnable
90-Day
Smart Home
Smart Home Enabled
Smart Home Protocol
Bluetooth
Timer Included
Yes
Voice Control Hub Required
No Voice Control
Voltage
Line Voltage
Watt Equivalence

28.53

Works With

Proprietary App

Warranty / Certifications

Certifications and Listings

1-UL Listed,cUL Listed

Manufacturer Warranty

5 Years

Recently Viewed Items



Defiant 270
Degree 3-Head
White LED Motion

(393)



Defiant 180
Bronze LED
Motion Outdoor

(785)



Defiant 180
Degree White LED
Motion Outdoor

(785)



Defiant 270-
degree White
Motion Activated

(340)



Defiant
Motion
Outdoor

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Internet #310380131 Model # CD-5909-BZ



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Defiant

270 Degree Bronze Motion Outdoor Integrated LED Flood Light with Clearview Edgelit Translucent Light Panel Technology

★★★★★ (13)

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[Questions & Answers \(1\)](#)

\$119⁹⁷

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Product Overview

Make your home more secure and stylish with this motion activated outdoor flood light. The CleaView Edgelit Translucent Light Panel Technology feature lets the light fixture blend in to your home exterior. The new technology allows dim accent light to shine from the back of the panels to create a soft wall wash ambient lighting affect. This fixture gives a warm white color temperature of 3000K at a bright 2000 Lumens. The DualBrite feature allows dim accent light from dusk to dawn and full bright when motion is detected.

- Clearview Edgelit translucent LED light panel technology
- DualBrite 2-level lighting comes on at a warm white (3000K) temperature which beautifies, protects and saves energy by utilizing accent light from dusk to dawn and full light when motion is detected
- Bright LED at 2000 Lumens output
- 270° motion detection up to 50 ft. range/features LED light sensor indicators for easy adjustments and notifications of functionality
- Tool-free lamp head and sensor adjustment
- DIY friendly with 2 easy steps to installation
- Eave or wall mount
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Info & Guides

- [Warranty](#)

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Defiant 270 Degree Bronze Motion Outdoor Integrated LED Flood Light with Clearview Edgelit ...
(13)

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(10)

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Clearview Edgelit

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Specifications

Dimensions

Product Depth (in.)
6.32
Product Height (in.)
7.74
Product Length (in.)
6.32
Product Width (in.)

13.96

Details

Actual Color Temperature (K)

2769

Adjustable Detection Sensitivity

Yes

Adjustable Lamp Head

Yes

Color Rendering Index (CRI)

80.5

Color Temperature

Soft White

Detection Range (ft.)

50

Dusk to Dawn

Yes

Electrical Features

Weather Resistant

Exterior Lighting Product Type

Floodlights

Fixture Color/Finish

Bronze

Fixture Material

Metal

Glass/Lens Type
Textured
Included
Motion Sensor,Mounting Hardware Included
Light Beam Angle
270
Light Bulb Type Included
Smart LED Bulbs
Lumens
2000
Motion Sensing
Yes
Number of Lights
2 Lights
Outdoor Lighting Features
Adjustable Detection Sensitivity,Adjustable Lamp Head,Dusk to Dawn,Motion Sensing,Weather Resistant,Weather Resistant
Pack Size
1 Pack
Pack Size
1 Pack
Power Options
Hardwired

Power Type

Low voltage

Product Weight (lb.)

2.17lb

Returnable

90-Day

Timer Included

Yes

Voltage

Line Voltage

Voltage Type

Line Voltage

Warranty / Certifications

Certifications and Listings

ETL Listed,FCC Listed

Manufacturer Warranty

5 Years

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Heath Zenith Link White Dual Head LED Motion Sensor Outdoor Security Flood Light

Model Number: HZ-5835-WH | Menards® SKU: 3569276



Online Price

EVERYDAY LOW PRICE	\$79.99
11% MAIL-IN REBATE Good Through 3/23/19	\$8.80
FINAL PRICE	\$71.19 each

You Save \$8.80 After Mail-In Rebate

Color: White ▾

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Description & Documents

All LiNK™ fixtures communicate; when one LiNK™ light turns on with motion, all LiNK™ lights turn on, for added safety and security around your home.

Shipping Dimensions: 12.5 H x 8.39 W x 6.3 D
Shipping Weight: 2.9 lbs

Brand Name: **Heath Zenith**



Features

- LiNK Technology
- Bright 2100 Lumen Output
- DualBrite- 2 Level Lighting
- Easy Install Technology
- 180 Degree Motion Detection
- Adjustable Detection Range up to 70 ft.

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Specifications



Overall Height	8.39 inch	Overall Width	12.5 inch
Overall Depth	6.3 inch	Weight	2.87 pound
Backplate Dimensions	4.25 inch	Lighting Feature	Motion
Product Type	Flood	Power Source	Direct Wire
Voltage	120V	Degree of Motion Detection	180
Detection Range	70 foot	Number of Bulbs Required	None (uses Integrated LED)
Total Light Wattage	2100 lumen	Bulb Type	LED
Bulb Base	None (uses Integrated LED)	Bulb Shape	None (Integrated LED)
Bulb Shape Code	None (uses Integrated LED)	Bulbs Included	No (Integrated LED)
Light Color Temperature	5000 kelvin	Light Output	2100 lumen
Material	Plastic	Fixture Color Family	White
Fixture Color/Finish	White	Shade/Diffuser Material	Polycarbonate
Shade/Diffuser Color/Finish	Frosted	Recommended Environment	Outdoor
Listing Agency Standards	cETLus Listed	Manufacturer Warranty	5 year

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Heath Zenith Link Bronze Dual Head LED Motion Sensor Outdoor Security Flood Light

Model Number: HZ-5835-BZ | Menards® SKU: 3569275



Online Price

EVERYDAY LOW PRICE	\$79.99
11% MAIL-IN REBATE Good Through 3/23/19	\$8.80
FINAL PRICE	\$71.19 each

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Color: **Bronze** ▾

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Shipping
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Description & Documents

All LiNK™ fixtures communicate; when one LiNK™ light turns on with motion, all LiNK™ lights turn on, for added safety and security around your home.

Shipping Dimensions: 12.5 H x 8.39 W x 6.3 D
Shipping Weight: 2.9 lbs

Brand Name: **Heath Zenith**



Features

- LiNK Technology
- Bright 2100 Lumen Output
- DualBrite- 2 Level Lighting
- Easy Install Technology
- 180 Degree Motion Detection
- Adjustable Detection Range up to 70 ft.

Specifications



Overall Height	8.39 inch	Overall Width	12.5 inch
Overall Depth	6.3 inch	Weight	2.87 pound
Backplate Dimensions	4.25 inch	Lighting Feature	Motion
Product Type	Flood	Power Source	Direct Wire
Voltage	120V	Degree of Motion Detection	180
Detection Range	70 foot	Number of Bulbs Required	None (uses Integrated LED)
Total Light Wattage	2100 lumen	Bulb Type	LED
Bulb Base	None (uses Integrated LED)	Bulb Shape	None (Integrated LED)
Bulb Shape Code	None (uses Integrated LED)	Bulbs Included	No (Integrated LED)
Light Color Temperature	5000 kelvin	Light Output	2100 lumen
Material	Plastic	Fixture Color Family	Bronze
Fixture Color/Finish	Bronze	Shade/Diffuser Material	Polycarbonate
Shade/Diffuser Color/Finish	Frosted	Recommended Environment	Outdoor
Listing Agency Standards	cETLus Listed	Manufacturer Warranty	5 year


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LED MOTION ACTIVATED SECURITY LIGHT

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HZ-5867
LED MOTION ACTIVATED SECURITY LIGHT

- Energy Saving LED Technology
- 1600 LM Output
- 190 Degree Motion Activated
- Adjustable Up To 70 ft Range
- Adjustable ON TIME
- DualBrite - 2 Level Lighting
- Frosted Lamp Lens
- Patented Easy Install Feature
- Tool- free Lamp Head and Sensor Adjustments
- Eave or Wall Mount
- Durable Polycarbonate - Rust Resistant Fixture

DUALBRITE

See More Details

☒ Color: White


☐ Color: Bronze






LED MOTION ACTIVATED SECURITY LIGHT

HeathZenith

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HZ-5867
LED MOTION ACTIVATED SECURITY LIGHT

- Energy Saving LED Technology
- 1600 LM Output
- 190 Degree Motion Activated
- Adjustable Up To 70 ft Range
- Adjustable ON TIME
- DualBrite - 2 Level Lighting
- Frosted Lamp Lens
- Patented Easy Install Feature
- Tool- free Lamp Head and Sensor Adjustments
- Eave or Wall Mount
- Durable Polycarbonate - Rust Resistant Fixture

DUALBRITE

See More Details

☐ Color: White


☒ Color: Bronze






LED MOTION ACTIVATED SECURITY LIGHT

HeathZenith

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HZ-5868

LED MOTION ACTIVATED SECURITY LIGHT

- Energy Saving LED Technology
- 2000 LM Output
- 180 Degree Motion Activated
- Adjustable Up To 70 ft Range
- Adjustable ON TIME
- DualBrite - 2 Level Lighting
- Frosted Lamp Lens
- Patented Easy Install Feature
- Tool- free Lamp Head and Sensor Adjustments
- Eave or Wall Mount
- Durable Polycarbonate - Rust Resistant Fixture

DUALBRITE

See More Details

☒ Color: White


☐ Color: Bronze


LED MOTION ACTIVATED SECURITY LIGHT

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LED MOTION ACTIVATED SECURITY LIGHT

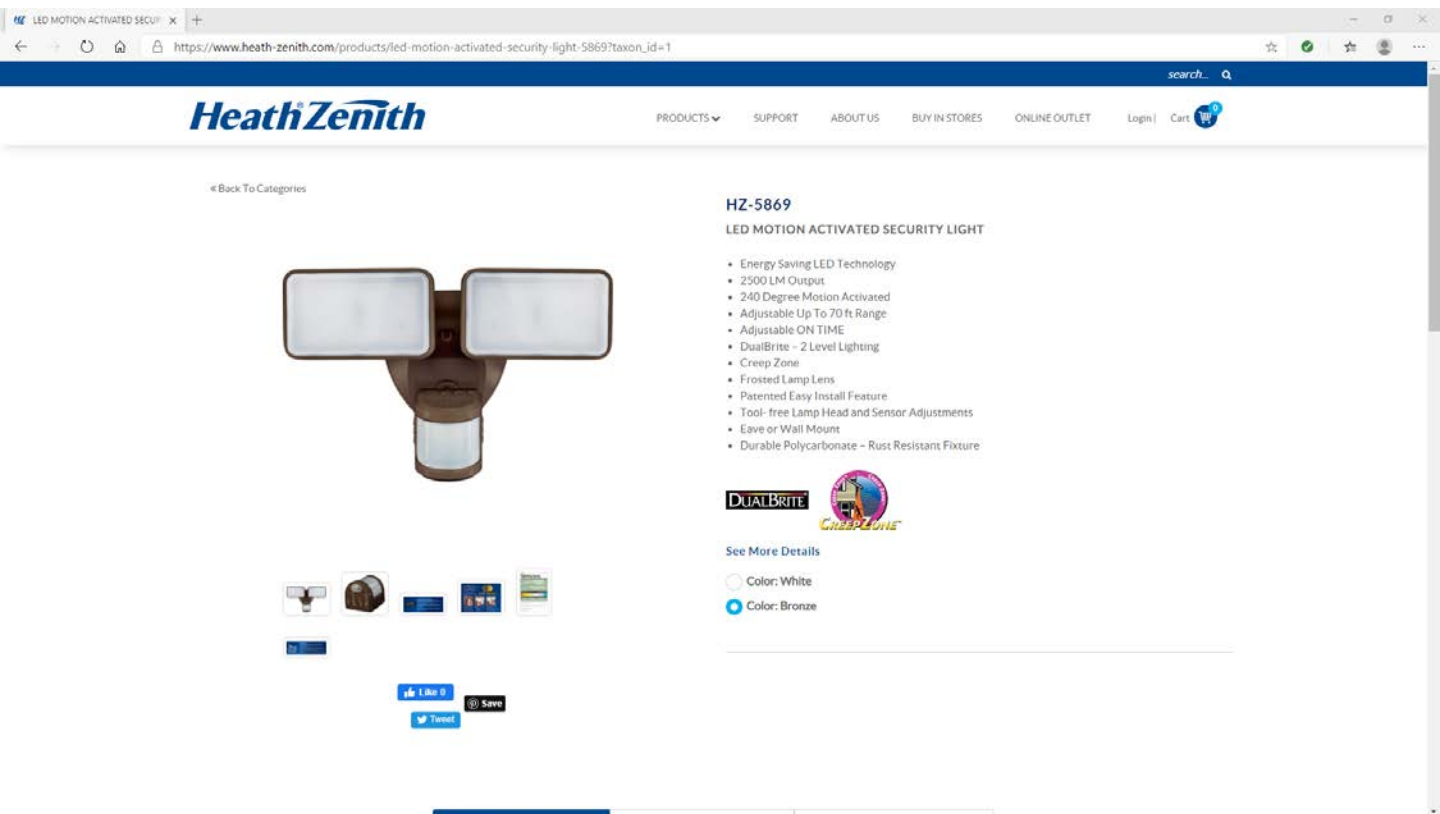
- Energy Saving LED Technology
- 2000 LM Output
- 180 Degree Motion Activated
- Adjustable Up To 70 ft Range
- Adjustable ON TIME
- DualBrite - 2 Level Lighting
- Frosted Lamp Lens
- Patented Easy Install Feature
- Tool- free Lamp Head and Sensor Adjustments
- Eave or Wall Mount
- Durable Polycarbonate - Rust Resistant Fixture

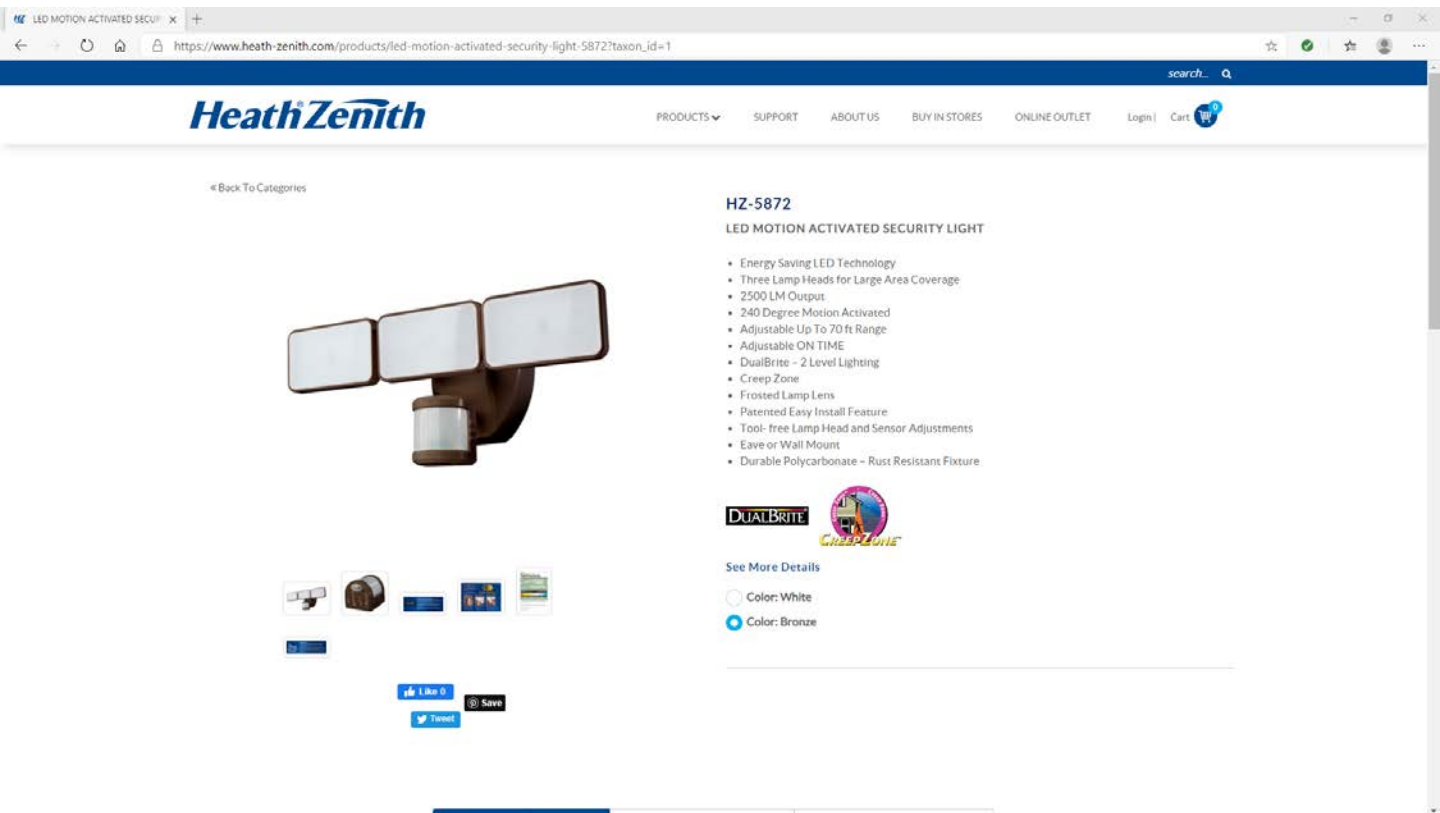
DUALBRITE

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☐ Color: White

☒ Color: Bronze





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Heath Zenith

Heath Zenith 2 Light 11" Wide LED Outdoor Dual Head Flood Light
Model: HZ-5835-WH [Write a Review](#)

\$101.91

Finish: White - 916 In Stock

Free Shipping!
Leaves the Warehouse in 2 to 3 business days - [Shipping to 30188](#)

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Recommended for You



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Heath Zenith

Heath Zenith 2 Light 11" Wide LED Outdoor Dual Head Flood Light
Model: HZ-5835-BZ [Write a Review](#)

\$101.91

Finish: Bronze - 813 In Stock

Free Shipping!
Leaves the Warehouse in 2 to 3 business days - [Shipping to 30188](#)

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Shipping to: Woodstock, GA

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Item # bcl3074216

Heath Zenith



Heath Zenith 2 Light 10-25/32\"

Model: HZ-5867-WH

[Write a Review](#)**\$67.83**

Finish: White - 33 In Stock

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Brands > Heath Zenith > Motion Sensors > Heath Zenith HZ-5867

Item # bcl3074215

Heath Zenith



Heath Zenith 2 Light 10-25/32\"

Model: HZ-5867-BZ

[Write a Review](#)**\$67.83**

Finish: Bronze - 1035 In Stock

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Brands > Heath Zenith > Motion Sensors > Heath Zenith HZ-5868 Item # bci3074218

Heath Zenith

Heath Zenith 2 Light 10-25/32" Wide Integrated LED Outdoor Dual Head Flood Light - Motion Sensor Activated
Model: HZ-5868-WH
[Write a Review](#)

\$89.99

Finish: White - 199 In Stock

Free Shipping!
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Brands > Heath Zenith > Motion Sensors > Heath Zenith HZ-5868 Item # bci3074217

Heath Zenith

Heath Zenith 2 Light 10-25/32" Wide Integrated LED Outdoor Dual Head Flood Light - Motion Sensor Activated
Model: HZ-5868-BZ
[Write a Review](#)

\$88.99

Finish: Bronze - 609 In Stock

Free Shipping!
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Case 1:20-cv-00224-LPS Document 27-2 Filed 09/29/20 Page 227 of 258 PageID #: 1504

Heath Zenith HZ-5869-BZ Bronze

Shipping to: Woodstock, GA

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Brands > Heath Zenith > Motion Sensors > Heath Zenith HZ-5869 Item # bci3074220

Heath Zenith

Heath Zenith 2 Light 10-25/32" Wide Integrated LED Outdoor Dual Head Flood Light - Motion Sensor Activated
Model: HZ-5869-WH

★ ★ ★ ★ ★ 1 Review | Write a Review

\$108.15

Finish: White - 889 In Stock

Free Shipping!
Leaves the Warehouse in 2 to 3 business days - Shipping to 30188

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Heath Zenith HZ-5869-BZ Bronze

Shipping to: Woodstock, GA

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Brands > Heath Zenith > Motion Sensors > Heath Zenith HZ-5869 Item # bci3074219

Heath Zenith

Heath Zenith 2 Light 10-25/32" Wide Integrated LED Outdoor Dual Head Flood Light - Motion Sensor Activated
Model: HZ-5869-BZ

★ ★ ★ ★ ★ 1 Review | Write a Review

\$108.15

Finish: Bronze - 907 In Stock

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Heath Zenith HZ-5872-WH

Shipping to: Woodstock, GA

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Brands > Heath Zenith > Security Lighting > Heath Zenith HZ-5872

Item # bci3074222



Heath Zenith

Heath Zenith 3 Light 15-1/2" Wide Integrated LED Outdoor Flood Light - Motion Sensor Activated
Model: HZ-5872-WH

★ ★ ★ ☆ ☆ 3 Reviews | Write a Review

\$117.97

Finish: White - 1592 In Stock

Free Shipping!
Leaves the Warehouse in 2 to 3 business days - [Shipping to 30188](#)

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Return & Shipping Details

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Heath Zenith HZ-5872-WH

Shipping to: Woodstock, GA

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Brands > Heath Zenith > Security Lighting > Heath Zenith HZ-5872

Item # bci3074221



Heath Zenith

Heath Zenith 3 Light 15-1/2" Wide Integrated LED Outdoor Flood Light - Motion Sensor Activated
Model: HZ-5872-BZ

★ ★ ★ ☆ ☆ 3 Reviews | Write a Review

\$117.97

Finish: Bronze - 946 In Stock

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Heath Zenith LINK Motion-Sensing Hardwired LED White Security Light

Item no. 3894599 | HZ-5835-WH

☆☆☆☆

No Reviews | [Write Review](#)

\$79.99

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Heath Zenith Link Motion-Sensing Hardwired LED Bronze Security Light

Item no. 3900909 | HZ-5835-BZ

☆☆☆☆

No Reviews | [Write Review](#)

\$79.99

ACE Rewards 799 Estimated Points @

- 1 +

Add To Cart

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Ex. N - Page 76 of 82

Heath-Zenith 28-Watt LED Outdoor Security Flood Light with Motion Sensor

https://www.wayfair.com/lighting/pdp/heath-zenith-28-watt-led-outdoor-security-flood-light-with-motion-sensor-gcfy1094.html

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★★★★★ 4.0 | [1 Review](#)

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Get it by Tue, Oct 6

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Select Fixture Finish

Bronze

White

1

Add to Cart

Heath-Zenith 28-Watt LED Outdoor Security Flood Light with Motion Sensor

https://www.wayfair.com/lighting/pdp/heath-zenith-28-watt-led-outdoor-security-flood-light-with-motion-sensor-gcfy1094.html?piid=38302673

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Back to Results Lighting / Outdoor Lighting / Security Lights & Flood Lights / All Security Lights & Flood Lights / SKU: GCFY1094

28-Watt LED Outdoor Security Flood Light with Motion Sensor

See More from [Heath-Zenith](#)

★★★★★ 4.0 | [1 Review](#)

\$87.99

\$40 OFF your qualifying first order of \$250+¹ [with a Wayfair credit card](#)

Shopping for a business? [Unlock insider pricing](#)

Select Fixture Finish

White

Bronze

White

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Heath Zenith 180-Degree 1600-Lumen Bronze-Integrated-LED-Motion-Activated-Flood-Light/1001204840


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Heath Zenith 180-Degree 1600-Lumen Bronze Hardwired Integrated LED Motion-Activated Flood Light
Item #1447292 Model #HZ-5867-BZ

- 1600 lumens LED
- Tool-less adjustment
- Easy install

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Delivery
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Have any questions? Chat with an Expert.
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Heath Zenith HZ-5867-WH Light LED Motion, White

Brand: Heath Zenith

★★★★☆ 11 ratings

List Price: \$62.99

Price: **\$51.76** ✓prime & FREE Returns

You Save: \$11.23 (18%)

Your cost could be \$41.76. Eligible customers get a \$10 bonus when reloading \$100.

Available at a lower price from other sellers, potentially without free Prime shipping.

Brand: Heath Zenith

Light Source: 22.54 Watts

Wattage

Item Dimensions: 9 x 13 x 13.07 inches

LxWxH

Voltage: 120 Volts

Color: 5000 Kelvin

Temperature

About this item

- Item Weight: 8.26 lb
- Country of Origin: Canada
- Color: White
- Brand name: Heath Zenith

See more product details.

\$50.99

Report incorrect product information.

Similar item to consider



LIT-PATH Outdoor LED Wall Lantern, Wall Sconce as Porch Light, 11W (100W Equivalent), 1000 Lumen, Aluminum Housing Plus Glass, Matte Black Finish, Outdoor Rated, ETL and ES Qualified
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★★★★★ (251)

OSTWIN 9W LED Light Bulbs 60 Watt

\$51.76

✓prime & FREE Returns

FREE delivery: Friday, Oct 2

Order within 23 hrs Details

Only 19 left in stock (more on the way).

Qty: 1

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Sold by: Amazon.com

Return policy: Returnable within

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Heath Zenith HZ-5867-BZ Light

https://www.amazon.com/HEATHCO-HZ-5867-BZ-Light-Motion-Bronze/dp/B01M66A4XJ/ref=pp_lpo_60_t_0/131-5277930-5895050?_encoding=UTF8&pd_rd_i=B01M66A4XJ&pd_rd_f=c5d830ae-abc1-4...

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Heath Zenith HZ-5867-BZ Light LED Motion, Bronze

Brand: Heath Zenith

★★★★☆ 9 ratings

List Price: \$62.99

Price: **\$47.69** ✓prime & FREE Returns

You Save: \$15.30 (24%)

Your cost could be \$37.69. Eligible customers get a \$10 bonus when reloading \$100.

Brand: Heath Zenith

Item Dimensions: 9 x 13 x 13.07 inches

LxWxH

Voltage: 120 Volts

Color: 5000 Kelvin

Temperature

About this item

- The Package Weight Of The Product Is 9.26 Pounds
- The Package Height Of The Product Is 14.07 Inches
- The Package Length Of The Product Is 10.0 Inches
- The Package Width Of The Product Is 14.0 Inches

See more product details.

New (13) from \$47.69 ✓prime FREE Shipping

Report incorrect product information.



LED Garage Lights, 80W Deformable LED Garage Ceiling Lights 12000 LM CRI 80 Led Shop Lights for Garage...

★★★★★ 709

\$39.99 ✓prime

\$47.69

✓prime & FREE Returns

FREE delivery: Saturday, Oct 3

Details

Only 2 left in stock - order soon.

Qty: 1

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Secure transaction

Ships from: Amazon.com

Sold by: Amazon.com

Return policy: Returnable within

30 days of receipt

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New (13) from

\$47.69 ✓prime FREE Shipping

Case 1:20-cv-00224-LPS Document 27-2 Filed 09/29/20 Page 233 of 258 PageID #: 1510

Heath Zenith HZ-5868-WH Security Light, White

Brand: Heath Zenith

★ ★ ★ ★ ★ 3 ratings

Price: **\$89.99** ✓prime & FREE Returns

Your cost could be \$79.99. Eligible customers get a \$10 bonus when reloading \$100.

Available at a lower price from other sellers, potentially without free Prime shipping.

Color: White

Brand: Heath Zenith

Material: Plastic

Item Weight: 2.98 Pounds

Light Source type: LED

About this item

- Item Weight: 8.26 lb
- Country of Origin: Canada
- Color: White
- Brand name: Heath Zenith
- See more product details

Compare with similar items

New (6) from **\$89.98** • FREE Shipping

Report incorrect product information.

Similar item to consider

Solar Lights Outdoor, KUFUNG 48 Led Lamp, Wireless Waterproof Solar Flood Light, Security Motion Sensor Light Outdoor Luce Solares for Deck, Fence, Patio, Front Door, Gutter, Yard, Shed, Backyard

\$89.99 ✓prime & FREE Returns

FREE delivery: **Friday, Oct 2**
Order within 22 hrs and 58 mins
Details

In Stock.

Qty: 1 ▼

Add to Cart

Buy Now

Secure transaction

Ships from Amazon.com
Sold by Amazon.com

Return policy: Returnable within 30 days of receipt

Support: Free Amazon tech support included

Add a Protection Plan:

- ☐ 4-Year Protection for **\$14.99**
- ☐ 3-Year Protection for **\$10.99**

☐ Add gift options

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HEATHCO HZ-5868-BZ Security Light, Bronze

Brand: Heathco

List Price: \$79.99

Price: **\$75.89** ✓prime & FREE Returns

You Save: \$4.10 (5%)

Your cost could be \$65.89. Eligible customers get a \$10 bonus when reloading \$100.

Color: Bronze

Brand: Heathco

Material: Plastic

Item Weight: 3 Pounds

Light Source type: LED

About this item

- Solar power, no wiring required. Power Reserve technology
- Solar charged battery provides 600 lumen, battery backup provides 200 lumen when weather prevents solar charging
- This product is manufactured in Canada
- See more product details

Compare with similar items

New (6) from **\$75.89** ✓prime FREE Shipping

Report incorrect product information.

Similar item to consider

Solar Lights Outdoor, KUFUNG 48 Led Lamp, Wireless Waterproof Solar Flood Light, Security Motion Sensor Light Outdoor Luce Solares for Deck, Fence, Patio, Front Door, Gutter, Yard, Shed, Path(4 Pack)

\$65.99 ✓prime

\$75.89 ✓prime & FREE Returns

FREE delivery: **Saturday, Oct 3**
Details

Only 2 left in stock (more on the way).

Qty: 1 ▼

Add to Cart

Buy Now

Secure transaction

Ships from Amazon.com
Sold by Amazon.com

Return policy: Returnable within 30 days of receipt

Support: Free Amazon tech support included

Add a Protection Plan:

- ☐ 4-Year Protection for **\$9.99**
- ☐ 3-Year Protection for **\$7.99**

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HEATHCO HZ-5869-WH Security Light, White

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Westinghouse

Westinghouse Security Light 1000 Lumens Solar Lights Outdoor... 4.5 stars 1,241 \$22.99 prime

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HEATHCO HZ-5869-WH Security Light, White

Brand: Heathco

4.5 stars 4 ratings

Price: \$100.73 prime & FREE Returns

Your cost could be \$90.73. Eligible customers get a \$10 bonus when reloading \$100.

Available at a lower price from other sellers, potentially without free Prime shipping.

Color White

Brand Heathco

Material Plastic

Item Weight 3.1 Pounds

Light Source type LED

About this item

- Solar power, no wiring required. Power Reserve technology
- Solar charged battery provides 600 lumens, battery backup provides 200 lumens when weather prevents solar charging
- Tool-free lamp head and sensor adjustments. Eave or wall mount

See more product details

Compare with similar items

New (4) from \$82.81 + \$13.91 Shipping

Report incorrect product information.

Similar item to consider

Solar Lights Outdoor, KUFUNG 48 Led Lamp, Wireless Waterproof Solar Flood Light, Security Motion Sensor Light Outdoor Luces Solares for Deck, Fence, Patio, Front Door, Gutter, Yard, Shed, Path(4 Pack) \$65.99 prime

Roll over image to zoom in

Secure transaction

Ships from Amazon.com

Sold by Amazon.com

Return policy: Returnable within 30 days of receipt

Support: Free Amazon tech support included

Add a Protection Plan:

- 4-Year Protection for \$29.99
- 3-Year Protection for \$21.99

Add gift options

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Only 2 left in stock - order soon.

Qty: 1

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Heath Zenith HZ-5869-BZ Security Light, Bronze

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Westinghouse

Westinghouse Wireless Linkable Intelligent Solar Motion Sensor... 4.5 stars 304 \$45.99 prime

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Heath Zenith HZ-5869-BZ Security Light, Bronze

Brand: Heath Zenith

4.5 stars 2 ratings

Price: \$100.73 prime & FREE Returns

Your cost could be \$90.73. Eligible customers get a \$10 bonus when reloading \$100.

Available at a lower price from other sellers, potentially without free Prime shipping.

Color Bronze

Brand Heath Zenith

Material Plastic

Item Weight 3.1 Pounds

Light Source type LED

About this item

- Item Weight: 4.06 lb
- Country of Origin: Canada
- Color: Bronze
- Brand name: Heath Zenith

See more product details

Compare with similar items

\$45.85 prime

Report incorrect product information.

Similar item to consider

Solar Lights Outdoor, KUFUNG 48 Led Lamp, Wireless Waterproof Solar Flood Light, Security Motion Sensor Light Outdoor Luces Solares for Deck, Fence, Patio, Front Door, Gutter, Yard, Shed, Path(4 Pack) \$65.99 prime

Click image to open expanded view

Secure transaction

Ships from Amazon.com

Sold by Amazon.com

Packaging Item arrives in pack...

Details

Return policy: Returnable within 30 days of receipt

Support: Free Amazon tech support included

Add a Protection Plan:

- 4-Year Protection for \$29.99
- 3-Year Protection for \$21.99

Add gift options

Deliver to Nadine - Woodstock 30188

Only 4 left in stock (more on the way).

Qty: 1

Add to Cart

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HEATHCO HZ-5872-WH Security Light, White

Tools & Home Improvement | hz-5872

amazon prime


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HEATHCO HZ-5872-WH Security Light, White
Brand: Heathco
★★★★☆ 2 ratings

Price: **\$109.99** ✓prime & FREE Returns
Your cost could be \$99.99. Eligible customers get a \$10 bonus when reloading \$100.

Color: White
Brand: Heathco
Material: Plastic
Item Weight: 3.75 Pounds
Light Source type: LED

About this item

- Item Weight: 6.0 lb
- Country of Origin: Canada
- Color: White
- Brand name: Heath/Zenith
- See more product details

Compare with similar items
New (4) from **\$109.99** ✓prime FREE Shipping
Report incorrect product information.

Similar item to consider

Solar Lights Outdoor, KUFUNG 48 Led Lamp, Wireless Waterproof Solar Flood Light, Security Motion Sensor Light Outdoor Lucus Solares for Deck, Fence, Patio, Front Door, Gutter, Yard, Shed, Path(4 Pack)
\$65.99 ✓prime
★★★★☆ (798)

\$109.99
✓prime & FREE Returns

FREE delivery: **Friday, Oct 2**
Order within 5 hrs and 25 mins
Details

Only 1 left in stock - order soon.

Add to Cart
Buy Now

Secure transaction

Ships from Amazon.com
Sold by Amazon.com

Return policy: Returnable within 30 days of receipt
Support: Free Amazon tech support included

Add a Protection Plan:
☐ 4-Year Protection for \$29.99
☐ 3-Year Protection for \$21.99

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HEATHCO HZ-5872-BZ Security Light, Bronze

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Westinghouse
Westinghouse Wireless Linkable Intelligent Solar Motion Sensor...

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HEATHCO HZ-5872-BZ Security Light, Bronze
Brand: Heathco
★★★★☆ 4 ratings

List Price: \$149.99
Price: **\$83.13** ✓prime & FREE Returns
You Save: \$26.86 (24%)
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Color: Bronze
Brand: Heathco
Material: Plastic
Item Weight: 3 Pounds
Light Source type: LED

About this item

- Solar power, no wiring required. Power Reserve technology
- Solar charged battery provides 600 lumen, battery backup provides 200 lumen when weather prevents solar charging
- This product is manufactured in Canada
- Package dimensions: 11.16" L x 16.55" W x 13.28" H
- See more product details

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EXHIBIT O

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Model # DFI-5996-WH Internet #301886086 Store SKU #1002578072



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Exclusive

Defiant
180° White Motion Activated Outdoor Integrated LED Twin Head Flood Light with Emergency Back Up Light

★★★★★ (24) [Write a Review](#) [Questions & Answers \(1\)](#)

- Hardwired Floodlight featuring Wall or Eave-mount Installation
- 180-degree motion detection with up to 70 ft. range
- Integrated LED produces 2350 lumens with 27.76-watt equivalence

\$89⁹⁷

	1	
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Quantity - +

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Product Overview

The New Defiant Twin Head LED motion security light with Emergency Light Technology chases away night time darkness even during a power outage. This LED motion light operates as a normal

motion light but will provide emergency lighting when there is a power outage. When power is restored the light will resume normal operation and automatically charge the lithium battery back to its full capacity to be ready for the next power outage.

- Emergency lighting feature with lithium battery technology allows the motion light to operate when there is a power outage
- DualBrite 2-level comes pre-set at a warm (3000k) temperature, this feature beautifies, protects and saves energy by utilizing accent light from dusk-to-dawn and full light when motion is detected
- Bright LED at 2350 lumens output (5399K) on electrical power: 400 lumen output in emergency light mode
- 180° motion detection with up to 70 ft. range
- Tool-free lamp head and sensor adjustment
- DIY friendly with 3 easy steps to installation
- Wall or eave mount
- Operating temperature range: -25°C (-13°F) to +50°C (+120°F)
- [Click here for more information on Electronic Recycling Programs](#)

Info & Guides

- [Instructions / Assembly](#)
- [SDS](#)
- [Troubleshooting Guide](#)
- [Warranty](#)

You will need Adobe® Acrobat® Reader to view PDF documents. [Download](#) a free copy from the Adobe Web site.

Specifications

Dimensions

Product Depth (in.)

6.89

Product Height (in.)

6.3

Product Length (in.)

6.89

Product Width (in.)

9.65

Details

Actual Color Temperature (K)

5000

Adjustable Detection Sensitivity

Yes

Adjustable Lamp Head

Yes

Color Rendering Index (CRI)

84

Color Temperature

Daylight

Detection Range (ft.)

70

Dusk to Dawn

Yes

Exterior Lighting Product Type

Floodlights

Fixture Color/Finish

White

Fixture Material

Plastic
Glass/Lens Type
Frosted
Included
Hardware Included,Motion Sensor,Timer
Light Beam Angle
180
Lumens
2350
Motion Sensing
Yes
Number of Lights
2 Lights
Outdoor Lighting Features
Adjustable Detection Sensitivity,Adjustable Lamp Head,Dusk to Dawn,Motion Sensing,Water Resistant
Power Options
Hardwired
Power Type
Hardwired
Product Weight (lb.)
1.81lb
Returnable
90-Day

Timer Included

Yes

Voltage

Line Voltage

Watt Equivalence

27.76

Warranty / Certifications

Certifications and Listings

1-UL Listed,ETL Listed,FCC Listed

Manufacturer Warranty

5 Years

Recently Viewed Items



Defiant 270
Degree White LED
Bluetooth Motion

(393)



Defiant 270
Degree Bronze
LED Bluetooth

(393)



Defiant 270
Degree Bronze
Motion Outdoor

(393)



Defiant 270
Degree 3-Head
White LED Motion

(393)



Defiant 270
Degree Bronze
Motion



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Heath Zenith® FlexView® Bronze Integrated LED Quad Head Motion Sensor Outdoor Security Flood Light

Model Number: HZV-5838-BZ | Menards® SKU: 3569245



Online Price

\$89⁹⁷
each

Color: Bronze

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Shipping

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Description & Documents

This motion-activated LED security flood light will help bring more security exactly where you need it. With a detection range of 70 feet and a motion detection range of 240 degrees, no space will be left in the dark. The bright, energy saving LED light will automatically turn on when motion is detected and includes the DualBrite® feature on the lower panels. DualBrite® allows the lower panels of the light to provide low-level lighting and illuminates to full brightness when motion is detected for optimal energy savings.

Shipping Dimensions: 12.48 H x 8.39 W x 6.30 D

Shipping Weight: 3.0 lbs

Brand Name: **Heath Zenith**



Features

- Motion activated and manual mode
- Mounting hardware included
- DualBrite® technology on lower light panels
- Easy installation mounting plate
- Tool-free sensor and lamp head adjustment
- Light is not dimmable
- This LED light has a CRI of 90, a color temperature of 5000K (Daylight), and is 2350 Lumens
- Life expectancy of 30,000 hours

Specifications



Overall Height	7.2 inch	Overall Width	11 inch
Overall Depth	6.2 inch	Weight	2.23 pound
Backplate Dimensions	4.38 inch	Lighting Feature	Motion
Product Type	Security Flood Light	Power Source	Direct Wire
Voltage	120V	Degree of Motion Detection	240
Detection Range	70 foot	Number of Bulbs Required	None (uses Integrated LED)
Maximum Wattage per Socket	38	Total Light Wattage	38
Bulb Type	LED	Bulbs Included	No (Integrated LED)
Light Color Temperature	5000 kelvin	Light Output	2350 lumen
Material	Polycarbonate	Fixture Color Family	Bronze
Fixture Color/Finish	Bronze	Shade/Diffuser Material	Plastic
Shade/Diffuser Color/Finish	Frosted	Recommended Environment	Outdoor
Listing Agency Standards	ETL Listed	Manufacturer Warranty	5 year
View Return Policy			

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Heath Zenith® FlexView® White Integrated LED Quad Head Motion Sensor Outdoor Security Flood Light

Model Number: HZV-5838-WH | Menards® SKU: 3569246



Online Price

\$ **89⁹⁷** each

Color: White

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Shipping

Available

Description & Documents

This motion-activated LED security flood light will help bring more security exactly where you need it. With a detection range of 70 feet and a motion detection range of 240 degrees, no space will be left in the dark. The bright, energy saving LED light will automatically turn on when motion is detected and includes the DualBrite® feature on the lower panels. DualBrite® allows the lower panels of the light to provide low-level lighting and illuminates to full brightness when motion is detected for optimal energy savings.

Shipping Dimensions: 12.48 H x 8.39 W x 6.30 D

Shipping Weight: 3.0 lbs

Brand Name: **Heath Zenith**



Features

- Motion activated and manual mode
- Mounting hardware included
- DualBrite® technology on lower light panels
- Easy installation mounting plate
- Tool-free sensor and lamp head adjustment
- Light is not dimmable
- This LED light has a CRI of 90, a color temperature of 5000K (Daylight), and is 2350 Lumens
- Life expectancy of 30,000 hours

Specifications



Overall Height	7.2 inch	Overall Width	11 inch
Overall Depth	6.2 inch	Weight	2.23 pound
Backplate Dimensions	4.38 inch	Lighting Feature	Motion
Product Type	Security Flood Light	Power Source	Direct Wire
Voltage	120V	Degree of Motion Detection	240
Detection Range	70 foot	Number of Bulbs Required	None (uses Integrated LED)
Maximum Wattage per Socket	38	Total Light Wattage	38
Bulb Type	LED	Bulbs Included	No (Integrated LED)
Light Color Temperature	5000 kelvin	Light Output	2350 lumen
Material	Polycarbonate	Fixture Color Family	White
Fixture Color/Finish	White	Shade/Diffuser Material	Plastic
Shade/Diffuser Color/Finish	Frosted	Recommended Environment	Outdoor
Listing Agency Standards	ETL Listed	Manufacturer Warranty	5 year
View Return Policy			

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Flexview 8-Watt LED Dusk to Dawn Outdoor Security Flood Light with Motion Sensor

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Fixture Finish (1)

Bronze

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1 ▾



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Product Overview



Wet Location (Direct Water Exposure)



Motion Sensor



Dusk to Dawn



Adjustable Lamp Head



Hardwired

Highlights



240-Degree Motion Detection

Keep your home safe and secure with motion detection lighting. This product offers 240-degree motion detection, perfect for corners and backyards.

[See More](#)

Description



What's Included?

✓ Motion Sensor

[See More](#)

Weights & Dimensions

▼

Specifications

^

Features	
Product Type	Flood Light
Fixture Material	Plastic
Power Source	Hardwired
Voltage	120 Volts
Dry, Damp or Wet Location Listed	Wet
What is Dry, Damp or Wet Location Listed	This indicates whether the fixture is safe to use in dry locations, damp locations (moist environments), or wet locations (direct exposure to water).
Number of Lamp Heads	4
Dusk to Dawn	Yes
Motion Sensor	Yes
Detection Zone	70 Feet
Detection Angle	240 Degrees
Two-Level Lighting	Yes

Adjustable Lamp Head	Yes
Maximum Wattage (per bulb)	8 Watts
Integrated LED	Yes
Integrated LED Wattage	34 Watts
Integrated LED Brightness (Lumens)	2600 Lumens
What is Integrated LED	This indicates that an LED light is built into the fixture. Integrated LED lights are more energy efficient and can last up to 50,000 hours. They cannot be replaced by the customer.
Dimmable	No
Mounting Placement	Wall/Ceiling
Mounting Included	Yes
Installation Hardware Included	Yes
Supplier Intended and Approved Use	Residential Use
Country of Origin	China
Warranty	
Commercial Warranty	No
Product Warranty	Yes

Warranty Length

Ex. O - Page 51 Year 2

Specifications

Title 20 - California Code of Regulations	Yes
ETL Listed	Yes



About The Shop

Heath Co is the manufacturer and marketer of Heath/Zenith branded products. Through innovation they have compiled a large portfolio of patented technologies and products giving them the competitive edge as an industry leader in the intelligent lighting and door chime markets.

More About This Product

When you buy a Heath-Zenith Flexview 8-Watt LED Dusk to Dawn Outdoor Security Flood Light with Motion Sensor online from Wayfair, we make it as easy as possible for you to find out when your product will be delivered. Read customer reviews and common Questions and Answers for Heath-Zenith Part #: HZ-5838- on this page. If you have any questions about your purchase or any other product for sale, our customer service representatives are available to help. Whether you just want to buy a Heath-Zenith Flexview 8-Watt LED Dusk to Dawn Outdoor Security Flood Light with Motion Sensor or shop for your entire home, Wayfair has a zillion things home.

Shipping & Returns



Questions & Answers







Reviews0

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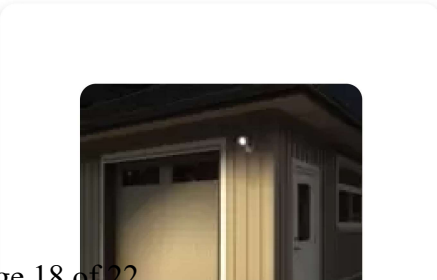
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by Heath-Zenith

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